

AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Volume 72

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Number 1

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Automotive Industries



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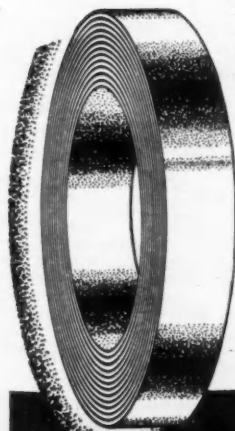
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January 5, 1935

"A CLUTCH IS THE THING
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Maybe one new car prospect in a hundred will ask about the clutch. The others don't know and *don't care*—don't care whether the clutch is made of green cheese so long as it never causes trouble. ¶ For twenty years Borg & Beck has been satisfying the motor car manufacturer, the mechanically minded buyer—and "those who don't care"—by designing and building clutches so nearly perfect that they are *taken for granted*. ¶ It's naturally good all around—good for the car, good for the dealer, good for us—that we build, and keep on building, clutches that are "taken for granted." That's how Borg & Beck clutches have built their reputation and made themselves the recognized standard of the industry. ¶ Build them right, *deliver them on time*—that's our record, our practice, our policy in a nutshell. And it perhaps explains why the year just past was the biggest year in Borg & Beck history.



THE BORG & BECK COMPANY

(Division Borg-Warner Corporation)

CHICAGO, ILLINOIS

Jan. Schedule—290,000 Units

Largest for Month Since '29; Dec. Production Hit 138,000

by Athel F. Denham,
Detroit Editor, Automotive Industries

Production schedules of automobile and truck factories for the month of January totaling slightly over 290,000 units represent the biggest schedule for that month since 1929. In only two years in the history of the industry, 1926 and 1929, have more units been built in the opening month of the year.

Testifying to the rapidity with which the industry is getting under full steam this year, January projections represent an 80 per cent increase over January last year, and a 110 per cent increase over even the unexpectedly high totals achieved by the industry for December.

The closing month of 1934 showed some 138,000 cars and trucks produced by the industry, final totals awaiting reports from outlying assembly plants. This total represents a 100 per cent increase over the previous month, a 65 per cent increase over December, 1933, and is larger than any December since 1928 with the single exception of 1930, when slightly over 160,000 units were built and shipped.

The December totals, exceeding even *Automotive Industries* original estimate by 10 per cent, are a good deal higher than generally anticipated even a few weeks ago, delays in Ford production early this month having been more than offset by the rapidity with which the various Chrysler units reached high quantity outputs. It is estimated by this publication that of the total almost 40 per cent is accounted for by the various Chrysler units, while General Motors is in second place with somewhat under 30 per cent of the total.

(Turn to page 8, please)

Cadillac-La Salle Prices Cut

The Cadillac Motor Car Co. has announced that prices on all Cadillac 8's, 12's and 16's have been reduced \$200. Simultaneously, La Salle prices were reduced \$150.

Automotive Industries

Oldsmobile Prices

SIX-CYLINDER	1935	1934
Business coupe	\$675	\$650
Sport coupe	725	695
Five-pass. coupe	725	695
Five-pass. tour. coupe	755	725
Four-door sedan	790	765
Convertible coupe	800	...
Four-door tour. sedan	820	785
EIGHT-CYLINDER		
Business coupe	860	885
Five-pass. coupe	870	895
Sport coupe	895	920
Five-pass. tour. coupe	900	925
Four-door sedan	940	965
Convertible coupe	950	975
Four-door tour. sedan	970	995

Chevrolet Master Prices Unchanged

Standard Six	New	Old
Coupe	\$475	\$485
Coach	485	495
Sedan	550	540
Phaeton	485	495
Spt. Rdstr.	465	465
Sedan Delivery	515	...
Master Six		
Coupe	560	560
Coach	580	580
Sedan	640	640
Sport Coupe	600	600
Town Sedan	615	615
Sport Sedan	675	675
Panel Delivery	560	...
DeLuxe Panel	580	...

Graham Prices

NEW SIX	1935	1934
2-d. sedan	\$595	New
4-d. sedan	635	New
SPECIAL SIX		
Business coupe	775	\$695
Rumble seat coupe	845	765
Convertible coupe	915	845
Touring sedan	845	810
EIGHT		
Business coupe	925	875
Rumble seat coupe	975	925
Convertible coupe	1,045	995
Touring sedan	975	960
SUPERCHARGED EIGHT		
Business coupe	1,095	1,045
Rumble seat coupe	1,145	1,095
Convertible coupe	1,215	1,165
Touring sedan	1,145	1,130

Improved Appearance, Riding Comfort Dominant Note at the New York Show

by Don Blanchard
Editor, Automotive Industries

The automotive industry launched its drive for increased sales in 1935 with the opening of the New York Show on Saturday of this week.

On the whole, the new cars reveal no major design trends that were not in evidence a year ago. There are no innovations which rank in interest with independent suspension and the radically different body designs which marked last year's exhibition. Nevertheless, the new cars do represent a material improve-

ment over their predecessors, particularly in riding comfort and appearance.

Prices have not been released on all lines as this is written, but partial data now available indicate that, despite some decreases, they will average somewhat higher than last year—the probable increase being of the order of five to 10 per cent. In view of higher labor and material costs, the increases appear moderate, and it seems clear that the in-

(Turn to page 4, please)

January 5, 1935

Automotive Facts and Figures

	1934	1933	Per Cent Change
Production—U. S. & Canada.....	2,885,000	1,986,208	+45
Cars	2,296,000	1,627,768	+41
Commercial vehicles	589,000	358,440	+65
Production by Wholesale Price Classes—Per Cent of Total Cars*			
Under \$500	66	81	...
\$501-\$750	29	14	...
\$751-\$1,000	3	2	...
\$1,000 and up	2	3	...
Production by Capacity Classes—Per Cent of Total Trucks			
1½ ton and under	92	92	...
1½-3 ton	6	7	...
3 ton and up	2	1	...
Average list price of cars	\$665	\$652	+2
Average list price of trucks	700	712	+2
Wholesale value of car production	\$1,145,000,000	\$795,305,000	+44
Wholesale value of truck production	308,800,000	192,132,000	+62
Wholesale value of total production—U. S. & Canada	1,453,800,000	987,436,000	+47
Wholesale value of parts and accessories for replace- ments, and service equipment	517,677,000	.....	...
Wholesale value of replacement tires	245,000,000	.....	...
Total	2,216,477,000	.....	...
U. S. Registrations*—Cars	21,584,193	20,557,493	+5
Trucks and buses	3,367,814	3,292,439	+6
Total	24,952,007	23,849,932	+5
World Registrations	34,600,000	33,330,572	+4
Taxes and Highway Costs			
Gasoline, federal, state and municipal	\$750,000,000	\$699,000,000	+7
Total on motor vehicle users	1,214,000,000	1,137,872,000	+7
Highway and street expenditures	1,600,000,000	.....	...
The Automotive Industry as a Customer			
Carloads of automotive freight	2,930,000	2,641,000	+11
Rubber used—per cent of total	80	73	...
Plate glass used—per cent of total	70	40	...
Steel and iron used—per cent of total	23	19	...
Hardwood used—per cent of total	9	14	...
Copper used—per cent of total	19	15	...
Lead used—per cent of total	39	35	...
Aluminum used—per cent of total	23	23	...
Nickel used—per cent of total	28	24	...
Gasoline used—per cent of total	85	85	...
Lubricants used—per cent of total	53	57	...
Gasoline consumption, gal.*	16,500,000,000	15,440,919,000	+7
Sales			
U. S. Retail*—Cars	1,886,000	1,494,000	+26
Trucks	405,000	246,000	+65
Total	2,291,000	1,740,000	+32
Foreign Sales—Total	435,000	243,000	+79
Value of U. S. retail car sales at list prices.			
The Industry's Distributing Organizations*			
Total car and truck dealers	36,900	35,265	...
Garages, service stations & repairshops	98,293	97,855	...
Total—Duplications eliminated	105,944	102,469	...
Wholesalers	5,759	5,430	...
Retail gasoline outlets	317,000	.....	...

All 1934 data partially estimated. All statistics from Automobile Manufacturers Association except those marked (*)

Minor Modifications On Cadillac-LaSalle

More Rubber in Engine Mountings; Interior Trim Among Alterations Made

Only minor modifications have been incorporated in the Cadillac-LaSalle line at this time, actual new models being deferred until next summer, according to the General Motors plan of staggered model announcements.

On the LaSalle line changes are largely in the form of interior trim, etc. On the Cadillac models a few minor mechanical modifications have also been made. In the Cadillac bodies interiors have been simplified and such items as garnish moulding panels eliminated. Upholstery has been changed to a plain effect and in some bodies hardware is lacquered to match interior finish. Instrument panels are etched in a basket-weave pattern to harmonize with the upholstery.

A metal apron has been substituted for

the smaller grille previously placed below the radiator grille on the Cadillac cars, giving a more continuous sweeping appearance viewed from the front, by interconnecting the front fenders. The radiator emblem has been removed.

Engine mountings have been further softened through the use of more rubber. Air cleaners are improved in detail and fan noise reduced by a reduction in the fan diameter.

APEM Supplementary Code Budgets Approval Asked

The code authorities of the automobile hot water heater and replacement axle shaft industries, both operating under APEM supplementary codes, have applied to the National Industrial Recovery Board for approval of their budgets for code administration expenses and the basis upon which contributions are to be made.

For the period from Sept. 1, 1934, to Aug. 31, 1935, the replacement axle shaft group has a total budget of \$6,000 and the basis of contribution is one-tenth of 1 per cent of the gross sales volume.

The total amount of the budget for the hot water heater group from July 6, 1934, to Dec. 31, 1934, is \$3,000. The basis of contribution is a pro rata assessment against all members of the industry based on the average monthly employment for July, August and September, 1934, covering all labor directly or indirectly employed in the assembly, motor and fan mounting structure, deflector and front shell fan shroud. In the case of a manufacturer who does not assemble any or all the heater units which he sells as a manufacturer, he is to report the number of employees engaged in the assembly of such units by his source of supply. The minimum assessment, irrespective of employment, is \$50.

Criticisms, objections or suggestions to and regarding these budgets must be made to Deputy Administrator Jo G. Roberts prior to Jan. 21.

AAA Names Cummings U. S. Racing Champion

Bill Cummings, winner of the 500 Mile International Sweepstakes on the Indianapolis Motor Speedway last Decoration Day, has been named as automobile racing champion of the United States.

Mauri Rose, of Indianapolis, was second, and Russell Snowberger, of Detroit, was third on the official 1934 standing released at national headquarters of the Contest Board of the American Automobile Association. Thirty-seven drivers earned points in four championship races and next year at Indianapolis and other title events their cars will carry numbers corresponding to places on the new roster.

Hudson Service Clinics Inaugurated at Factory

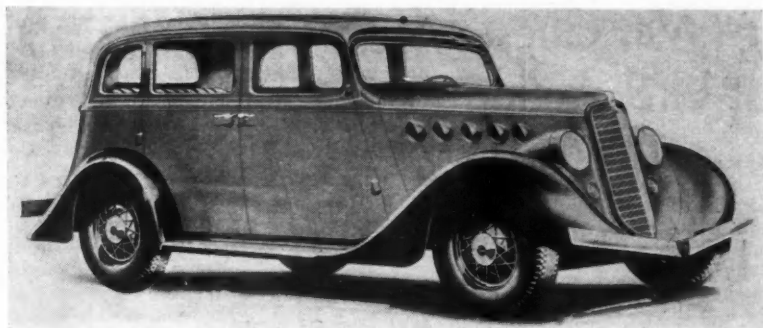
A program for the instruction of service men throughout the United States handling mechanical work on Hudson and Terraplane cars is now under way. A clinic for distributor's parts and service managers from all over the country has just been completed at the factory. This convention lasted four days, during which time these service men were given an intensive course of training on the 1935 cars.

The returning distributors' service men will hold clinics similar to that attended at the factory. They will be assisted by factory trained men.

T. H. Stambaugh, general service manager of the Hudson Motor Car Co., who has organized this series of clinics, has had prepared a detailed program with illustrating films together with practical demonstrations and carefully prepared instructions.

Packard Renews Contract With Commercial Credit

The Commercial Credit Co. and Packard Motor Car Co. have agreed upon a renewal of the exclusive contract for wholesale and retail financing of Packard cars, which has been in effect for several years. The new retail time sales plan will be released with the announcement of the new lower-priced Packard car, including rates and insurance coverage through all Packard dealers.



The 1935 Willys 77

A new frontal appearance features the four-cylinder Willys 77 for 1935

Report AFL to Consider Triple Strike in Motor, Steel, Textile Industries

Talk of a triple strike in the automobile, steel and textile industries has been stirred anew by an AP dispatch from Charlotte, N. C., quoting Francis J. Gorman, first vice-president of the United Textile Workers, as saying that "a proposal for joint action by textile, steel and automobile manufacturing workers to compel corporations in these industries to recognize collective bargaining would be discussed by the Executive Council of the American Federation of Labor in January at Washington."

Some union leaders, while evidently desiring to emphasize that the triple strike proposal will be discussed, affect to give the impression that the meeting will deal chiefly with the Federation's legislative program. Others are more outspoken and "privately" predict the triple strike will follow the meeting, just when not being indicated.

It is understood that the meeting will be held January 29 and, if that date is correct, it is regarded well-timed. Assuming organized labor strategy is sound, Congress will hardly have gotten under way when it will be impressed by a demonstration of union strength. Moreover, the automobile manufacturing code will expire February 1, just three days after the meeting. In addition, organized labor is claiming that automobile production and with it steel output is being accelerated rapidly now because of apprehension over labor trouble later. Some of the more radical leaders are reported to be insisting accordingly that now is the time for a strike, but they lack the support of many of their associates as well as of non-union workers.

The Federation is seeking union recognition and acceptance of the majority rule, and is bitterly fighting these three industries which insist upon minority representation. Mr. Gorman and other union leaders contend that these industries are united to "prevent realization by labor of its right to organize and bargain collectively." While

the chief fire is directed at the steel, automobile and textile industries, a heavy barrage also has been laid down against the oil and tobacco industries.

Oil, Kindred Lines Get Pontiac Maintenance Data

Pontiac is furnishing the oil and associated industries with comprehensive maintenance data on its 1935 models, including a shop manual, owner's handbooks, lubrication charts, etc. According to Lewis K. Marshall, general service manager, distribution of service literature in this manner has been adopted as a permanent Pontiac policy.

Motor Workers, Sixth of Retail Trades Total

One-sixth of all persons engaged in the wholesale, retail and service trades in this country are dependent upon the automotive and petroleum industries, according to figures recently compiled by the U. S. Bureau of Census, for their employment and wages.

The bureau figures show that of the 2,133,437 wholesale, retail and service establishments operating in this country in 1933, 383,347 catered directly to the owners and operators of automobiles. Approximately 16 per cent, or \$801,006,000 of a total of \$5,058,803,000 wages paid in this field were paid to workers employed in the automotive and petroleum industries.

Firms making automotive and allied sales exclusively had 655,012 full-time employees last year and provided part-time employment for 101,137 persons. There were 6,303 firms wholesaling automotive products exclusively; 28,421 wholesalers of petroleum and its products; 30,646 retail motor vehicle dealers; 16,027 retail dealers in accessories, tires and batteries; and 170,404 filling stations.

New Chevrolet Plant Ready by February 1

The new Chevrolet assembly plant at Camp Holabird, Md., just outside Baltimore, is nearing completion and it is expected that everything will be ready to begin assembly of cars there by the first week of February, according to M. E. Coyle, president and general manager of the company.

Passenger Car Production by Wholesale Price Classes (U. S. and Canada)

11 Months 1934 and 1933 Compared

	1934	1933	Per cent change	Per cent of Total 1934	Per cent of Total 1933
Under \$500	1,417,238	1,279,249	+ 10.79	65.85	81.26
\$501-\$750	630,978	227,627	+177.20	29.32	14.46
\$751-\$1,000	61,969	29,862	+107.52	2.88	1.90
\$1,001-\$1,500	25,620	17,806	+ 43.88	1.19	1.13
\$1,500-\$2,000	7,903	9,956	- 20.62	.37	.63
\$2,001-\$3,000	6,499	8,100	- 19.77	.30	.51
\$3,001 and over	1,976	1,807	+ 9.35	.09	.11
Total	2,152,183	1,574,407	+ 36.70	100.00	100.00

Truck Production by Capacities—11 Months (U. S. and Canada)

	1934	1933	Per cent change	Per cent of Total 1934	Per cent of Total 1933
1½ tons and less	515,615	302,154	+70.65	92.49	92.19
2-3 tons	33,966	21,220	+60.07	6.10	6.47
3½ tons and over	5,823	3,174	+83.46	1.04	.97
Special and buses	2,070	1,199	+72.64	.37	.37
Total	557,474	327,747	+70.09	100.00	100.00

Houde Workers Organizing "War Chest" To Finance Defense Against U.S. Action

The Houde Welfare and Athletic Association, the independent vertical union of employees of the Houde Engineering Corp., apparently means business in its petition of intervention in the case of the United States against the Houde Corp. It is organizing for the establishment of a "war chest" to supply the funds necessary to fight its legal battle.

In an agreement dated Dec. 26, and made public by Edward W. Hamilton, attorney and author of the Hamilton plan of men and management relationships, the Houde Welfare and Athletic Association establishes an Employee's Protection Fund, and appoints a committee of three prominent Buffalonians to supervise the collection and distribution of the fund. Mr. Hamilton says that all three have agreed to act. They are Carlos C. Alden, dean of the College of Law, University of Buffalo; Stephen T. Lockwood, former United States Attorney for the Western New York District in the Wilson Administration, and the Rev. Dr. Charles D. Broughton, a prominent Buffalo clergyman. All three are known for their interest in and support of the workers.

The first paragraph of this agreement sets forth that "contributions to the Employees' Protective Fund will be sought only from independent employees and any other persons or corporations, except the Houde Engineering Corporation, which believe in the principle that Capital and Labor are equally dependent one upon the other, that the bargaining power of Men and Management should be equalized, and that industrial peace and prosperity will be promoted by the general adoption of the Hamilton Plan as embodied in the constitution of The Aircraft and its work agreement with the Curtiss Aeroplane & Motor Company, Inc., of Buffalo, N. Y."

It is specified that all immediate contribu-

tions to the Employees' Protection Fund will be used for the reasonable and legitimate expenses incurred and to be incurred by the Houde Welfare and Athletic Association in protecting and enforcing the rights of the independent employees of the Houde Engineering Corp., in the so-called Houde case in such a way that these employees may be placed as nearly as possible on an equality with the other litigants in the case in respect of financial resources.

There is a hint of future activity in paragraph 5 which says that after the disposal of the Houde case any remaining funds will be used to promote the adoption by "Capital and Labor of the principles embodied in the Hamilton Plan for the settlement of labor controversies and in putting the plan into operation generally throughout the United States." Joseph W. Dambach, president, and Charles D. Hortman, secretary, sign the agreement for the Houde Welfare and Athletic Association.

Continental to Exhibit Diesel Rail Car Engine

Continental Motors Corporation will exhibit at the New York automobile show the first radial type Diesel rail car engine built in this country. It is a two-stroke, single-sleeve-valve, supercharged, ten-cylinder engine developing 635 hp. at 1400 r.p.m. The engine develops 1 hp. for every 6.5 lb. of engine weight and is therefore far lighter than engines now used for similar purposes. It is also more compact.

Complete with all accessories the engine alone weighs 3900 lb. and the engine-generator unit, 9200 lb. The length of

the complete unit is 82 in. The new unit is thought to be also well adapted for powerplant purposes in small central stations, factories and large apartment houses. No. 4 furnace oil is recommended as fuel because it is most available. We are informed that the company plans to develop a full line of similar engines to meet all transportation and stationary needs.

A Correction

In the Dec. 29 issue of *Automotive Industries* in connection with descriptions of various Chrysler models mention was made of a babbitt-lined steering knuckle bushing. We are advised that this was an error in the specifications and that the bushing used is of the steel-backed type lined with high leaded copper.

New Reo Prices

Prices on the new Reo Flying Cloud are \$795 on two-door sedan and \$845 on the four-door. In the Royale line, the coupe and four-door sedan both list at \$985. The self-shifter transmission is \$50 extra on all models.

Appearance, Comfort Dominant at New York

(Continued from page 1)

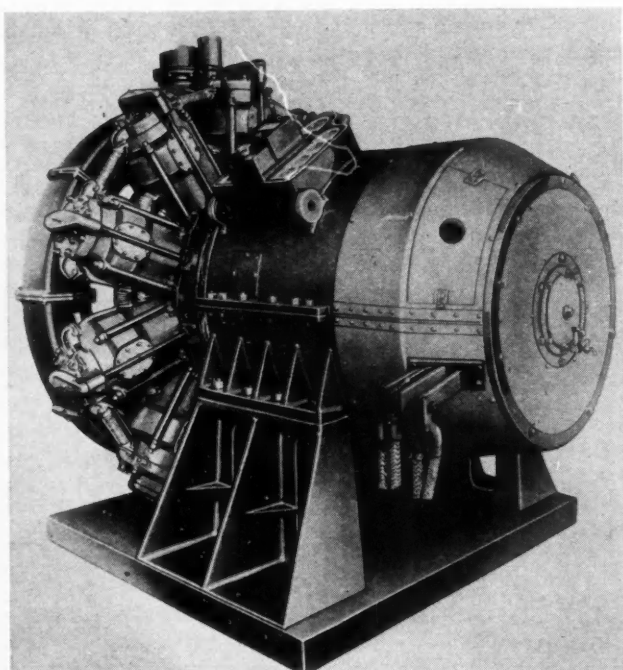
industry as a whole is staking its hope for profit on substantially increased volume—on many cars sold on a narrow margin rather than fewer at a greater mark-up. In addition, to stimulate volume, an increased number of manufacturers are adding models in lower price fields than they have previously operated.

The outstanding appearance trends are narrower radiator grills, more slope to windshields and sweeping, rather sharply inclined rear body panels. There is a quite general tendency to get the spare tire out of sight by mounting it inside the compartment provided by the sweeping tails. More chromium-plated moldings are used, radiators are further forward, and the "louwer" engineers appear to have put in a hard year's work.

Within the industry, there is undoubtedly going to be some wise-cracking about the difficulty of telling the different makes apart, and some criticism of the lack of originality displayed by the body engineers. Such criticism, of course, overlooks the fact that in a style industry, it pays to be in style, human beings being what they are. Concluding this brief survey of 1935 externals, it seems fair to mention that automobile styles this year appear once again to have been influenced profoundly by the LaSalle, as was the case some years back when that car was first put on the market.

From a construction standpoint, the most important body development probably is the all-steel top, and its adoption presumably means that the noise difficulties which have been held to block its use heretofore, have been overcome.

Independent springing has been dropped



The first radial type Diesel engine built in this country for rail car use. The engine is being exhibited by the Continental Motors at the New York Show opening today

on some makes and adopted on others. But on practically all of the 1935 models riding comfort has been increased, the improvement being attained most commonly by shifting weight forward, as pioneered by Chrysler, and softening the front springs so that they have the same deflection as the rear springs, thus reducing the frequency of pitching motion. Because of the forward shift of power-plants to put more weight on the front springs, it has been possible to move dashes further forward with the result that it is now quite common for rear-seat passengers to be somewhat forward of the rear axle. Bodies also are longer and wider on many lines. The tendency to increase wheelbases continues, but it is much less pronounced than in some previous years.

Engine output still is going up, but the increases in 1935 in many cases are due to higher compressions and improved volumetric efficiency, rather than to larger piston displacements. Greater provision is being made for clutch ventilation, and at least two makes have clutches in which centrifugal force adds to spring pressure. Synchronizing transmissions are more generally used, and Hudson is offering a power-shifting pre-selecting device optionally. Overdrives are finding wider use. Hydraulic brakes are decidedly more popular, while there is a noticeable tendency toward larger, lower-pressure tires.

Studebaker Plan Gets Court's Tentative OK

The reorganization plan of the Studebaker Corporation was tentatively approved by Judge Thomas W. Slick in Federal court when it was presented in a session of the court held in Fort Wayne, Ind., Dec. 27. Twenty-five per cent of the creditors made a formal approval of the plan. Copies of the plan will now be sent to all creditors and

Individual Cadillac Workers Capture ALB Collective Bargaining Election

The final election of Cadillac workers as collective bargaining representatives resulted, as anticipated by *Automotive Industries*, in the naming of individuals rather than labor organizations to the agency. Only one designated American Federation of Labor candidate was elected, and to provide the Works Council with proportional representation the Automobile Labor Board has added one man from the works council.

Of the 16 men elected by the workers every one had either served on a Cadillac works council or had been a runner-up in a works council election. Eleven of the 16 elected members of the bargaining agency are members of the present works council. It is understood that six of the 17 men named are members of the A. F. of L. union in the plant, but they were elected as individuals and not as members of the A. F. of L. Of this number, as already reported, only one was elected as representing the

labor organization. None of the three highest scoring men in the final election bore any organization designation.

The total number of votes cast in the final election gave some indication that some members of the A. F. of L. and MESA disregarded the instructions of their organizations and did cast their ballots. The total number of ballots in the final voting was 1657, a larger number than voted in the primary. Despite the fact that the largest department of the plant was shut down the day of the final balloting, and consequently fewer men from this department voted, yet a larger total number of votes were cast than at the primary, since practically every other department showed an increase in the total number of votes cast.

For the present, at least, it appears that so far as the Cadillac workers are concerned the question of proportional versus majority rule is a dead issue as long as the Automobile Labor Board maintains jurisdiction over the labor phase of the industry.

stockholders for their consideration. Approval by a majority of each class of stockholders and by a two-thirds vote of the creditors of each class of debt will be necessary before the plan becomes operative.

William Watts Macon

William Watts Macon, former editor-in-chief of *The Iron Age* and latterly consulting editor of that publication, died Tuesday in the Murray Hill Hospital, New York City. Mr. Macon was 59 years old.

Truckers to Determine Policy on Regulation

When the policy committee of the American Trucking Associations, Inc., meet in Washington Jan. 7 and 8 the attitude of this association toward federal regulation of motor trucks will be crystalized, according to Ted V. Rodgers, president of the ATA. During the same week as the policy committee meeting the National Code Authority of the trucking industry also will meet.

New Passenger Car Registrations—11 Months

	November 1934	October 1934	November 1933	Eleven Months		Per cent change, 11 Mos., 1934 over 1933	Per cent of Total First Eleven Months	
				1934	1933		1934	1933
Ford	23,295	38,641	20,771	516,462	292,773	+ 76.1	28.48	20.40
Chevrolet	36,807	38,076	25,587	509,165	464,490	+ 12.0	28.08	32.36
Plymouth	13,482	22,240	18,996	290,654	237,491	+ 22.4	16.04	16.55
Dodge	5,496	6,918	6,445	86,171	81,639	+ 5.3	4.75	5.69
Pontiac	3,985	4,891	4,452	70,501	83,216	- 15.3	3.89	5.80
Oldsmobile	4,819	6,332	1,815	69,530	34,429	+ 102.0	3.83	2.40
Buick	4,748	6,160	1,682	59,210	43,010	+ 37.8	3.27	3.00
Studebaker	2,512	3,093	4,218	39,447	33,416	+ 18.0	2.18	2.33
Terraplane	2,212	3,293	1,843	38,677	34,821	+ 11.1	2.13	2.43
Chrysler	2,435	2,841	1,330	26,704	28,008	- 4.6	1.47	1.95
Hudson	1,030	1,524	139	18,405	2,867	+ 544.0	1.01	.20
Nash	1,022	1,132	1,112	13,652	9,816	+ 39.0	.75	.68
Graham	656	1,003	587	12,275	9,656	+ 27.0	.68	.67
De Soto	721	967	1,206	10,963	20,546	- 46.6	.60	1.43
LaFayette	947	1,066	....	8,589	....	....	.47	....
Willys	308	420	775	6,323	14,750	- 57.1	.35	1.03
Packard	599	635	624	6,071	8,721	- 30.4	.34	.61
Hupmobile	675	616	445	5,926	6,448	- 8.0	.33	.45
Auburn	450	651	204	5,153	4,840	+ 6.3	.28	.34
La Salle	360	374	254	4,303	3,604	+ 36.0	.27	.25
Cadillac	395	330	191	4,640	3,783	+ 22.9	.26	.26
Reo	262	310	342	3,620	3,424	+ 5.9	.20	.24
Lincoln	187	182	87	1,964	2,001	- 1.7	.11	.14
Pierce-Arrow	110	90	265	1,641	2,041	- 19.6	.09	.14
Austin	94	61	171	969	3,558	- 72.7	.05	.25
Continental	6	7	451	945	2,955	- 68.0	.05	.21
Franklin	3	5	97	358	1,277	- 71.9	.02	.09
Miscellaneous ..	32	22	56	300	1,530	- 80.4	.02	.12
Total	107,648	140,880	94,145	1,813,218	1,435,170	+ 26.3	100.00	....
Chrysler Corp. . .	22,134	32,966	27,977	414,492	367,744	+ 12.8	22.86	25.62
Ford and Lincoln .	23,482	38,823	20,858	518,426	294,774	+ 75.9	28.59	20.54
General Motors. . .	51,114	55,163	33,981	717,949	632,532	+ 12.5	39.60	44.07
All Others	10,918	13,928	11,329	162,351	140,120	+ 16.0	8.95	9.77

NIRB Outlines Extent of Admissible Testimony at Code Price Hearings

To prevent the hearings on code price provisions which begin before the National Industrial Recovery Board Jan. 9, from becoming unwieldy and eliminate the introduction of irrelevant testimony the Board has issued a statement outlining the exact scope of the hearings and fixing the time limits for the presentation of oral testimony.

The Board's statement says it will hear evidence concerning the operation of price provisions both in general and under particular approved codes, but the hearing is not concerned with proposals to amend any particular code. However, the hearings may be expected to extend over a rather broad field, inasmuch as the Board will hear testimony on any topic to the extent that the evidence and topic are definitely related to the subject of price control or price stabilization.

Upon this basis the testimony which may be presented without limitation can cover such subject matter as operation of fixed minimum prices, selling below cost provisions, mark-ups, loss limitations, open price filing with or without waiting periods, discounts, basing points, price reporting, resale price maintenance, cost accounting formulae and systems, free deals, consignment selling and seconds. Also production control, capacity limitations and machine hour limitations may be considered, but only insofar

as these relate to the subject of price control or price stabilization.

The Board prefers that all oral testimony be limited to 10 minutes and 15 minutes at the most. Written testimony may be presented in lieu of the oral presentation of testimony, or in addition to such statements.

All persons desiring to present their testimony orally should (a) file their request to be heard, (b) their affiliation, and (c) their subject or topic with the NIRB by noon, Jan. 8.

Ryerson & Haynes Enlarges Plant; Opens Detroit Office

Ryerson & Haynes, Inc., of Jackson, Mich., has enlarged its manufacturing facilities. An adjoining plant has been taken over and equipped, and over 500 additional men added to the force.

A Detroit office has been established at 2-239 General Motors Building.

Hudson Employment Now 60% More Than Year Ago

Hudson, according to company reports, began 1935 operations in its Detroit plants with 8800 men on the payrolls, a gain of 60 per cent compared with the 5500 men employed the first working day of 1934.

The company's production schedule for

Ten Big Automotive News Stories in '34

Adoption of Independent Suspension
Airflow Body Construction
The President's Automobile Settlement
The ALB Lay-Off Rules
The NLRB Houde Decision
The President's Inquiry into Automotive Employment
The Pennsylvania Automotive Association Dealer Profit Survey
New York and Chicago National Shows Become Dealer Exhibitions
Production Up 45 Per Cent from 1933
Foreign Sales Increase 79 Per Cent

1935 calls for an output of more than 100,000 cars compared with the approximately 86,000 vehicles produced during last year. This estimated production will be the largest for any year since 1930 when actual shipments amounted to 113,898 cars.

Armstrong Cork Forms New Distributing Subsidiary

All Armstrong products formerly sold by the Armstrong Cork Co. and the Armstrong Cork & Insulation Co. will be distributed by a subsidiary company, to be known as "Armstrong Cork Products Co.," according to an announcement issued at the executive offices of the company in Lancaster, Pa. This change became effective Jan. 1.

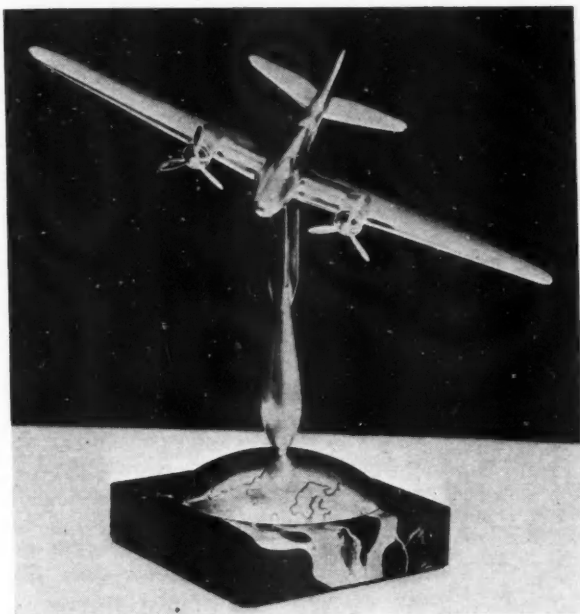
The change in the name of the sales organization does not in any way alter Armstrong's distribution policies or personnel. All corporate functions other than marketing will be continued under the name Armstrong Cork Co., it was stated.

Automotive Industry's Exports Increased \$96,400,000 in Jan.-Nov. Period Over '33

EXPORTS	November 1934		November 1933		Eleven Months Ended November			
	Number	Value	Number	Value	1934	Value	1933	Value
Automobiles, parts and accessories .....	.....	\$11,017,531	.....	\$7,342,992	.....	\$177,795,605	.....	\$81,324,516
Motor trucks, buses and chassis (total)....	7,072	3,322,897	3,176	1,878,429	85,582	40,473,083	37,056	17,215,675
Under one ton	777	264,319	395	140,356	8,744	2,867,911	4,201	1,236,502
One and up to 1½ tons	5,340	2,209,188	1,842	886,655	66,369	27,834,334	27,340	10,519,319
Over 1½ tons to 2½ tons	849	721,992	778	629,902	8,509	6,878,620	4,214	3,447,062
Over 2½ tons	76	113,827	136	204,943	1,594	2,651,517	1,053	1,880,689
PASSENGER CARS								
Passenger cars and chassis	9,208	4,071,121	3,527	2,041,771	136,876	74,362,633	61,445	30,298,439
Low price range \$850 inclusive	8,572	3,332,506	3,159	1,675,255	125,777	62,110,261	57,034	25,355,896
Medium price range over \$850 to \$1,200	373	364,388	199	186,613	7,396	7,133,410	2,427	2,339,647
\$1,200 to \$2,000	84	127,462	61	100,864	1,928	2,926,649	1,021	1,556,580
Over \$2,000	88	213,492	19	51,726	685	1,774,018	303	791,244
PARTS, etc.								
Parts except engines and tires .....	.....	.....	.....	.....	.....	.....	.....	.....
Automobile unit assemblies .....	.....	1,163,025	.....	1,264,714	.....	34,115,663	.....	16,186,115
Automobile parts for replacement (n.e.s.)....	.....	1,834,877	.....	1,601,193	.....	20,025,069	.....	11,836,463
Automobile accessories (n.e.s.) .....	.....	192,913	.....	198,806	.....	2,353,323	.....	1,377,523
Automobile service appliances .....	.....	214,711	.....	137,729	.....	2,216,309	.....	919,114
Airplanes, seaplanes and other aircraft	15	360,816	34	471,876	471	7,744,411	377	5,180,569
Parts of airplanes, except engines and tires...	.....	695,649	.....	142,445	.....	4,429,854	.....	2,114,149
INTERNAL COMBUSTION ENGINES								
Stationary and Portable:								
Diesel and semi-diesel	19	129,036	9	25,270	130	370,751	37	133,545
Other stationary and portable:								
Not over 10 hp.	958	29,254	316	19,924	5,347	344,127	2,916	185,685
Over 10 hp.	162	70,676	36	15,883	1,060	600,525	698	291,420
Automobile engines for:								
Motor trucks and buses	172	23,593	228	38,488	3,845	505,868	1,914	257,215
Passenger cars	239	18,913	186	15,712	20,448	1,295,278	18,747	1,138,635
Aircraft	82	577,007	341	102,682	941	3,917,403	2,633	1,221,517
Accessories and parts (carburetors).....	.....	101,560	.....	83,090	.....	1,246,117	.....	875,420
IMPORTS								
Automobile and chassis (dutiable)	61	22,647	62	34,034	526	149,913	492	274,577

January 5, 1935

Automotive Industries



"The Berry Brothers Trophy" to be presented as first prize in one of the main events of the Miami Air Races to be held Jan. 10, 11 and 12 at Miami, Florida

First GM Dealer Councils Named

4 Geographical Sections Represented; to Choose New Groups Each 6 Mos.

The first of the dealer councils, inaugurated by Alfred P. Sloan, Jr., GM president, to meet with a group of the corporation's executive committee to determine major policies, particularly with respect to distribution, has been named. These councils are drawn from four geographic locations, Pacific Region, Western Region, Northeastern Region and Southeastern Region and consist of 12 dealers each.

For the Pacific Region Council the dealers are Winslow B. Felix, Los Angeles; Ernest Ingold, San Francisco; L. M. Norton, Seattle; Arthur Fields, Portland, Ore.; F. B. Streater, Salt Lake City; R. F. Thompson, San Francisco; G. O. Scherer, Eugene, Ore.; George A. Braley, Portland, Ore.; L. J. Campbell, Boise; Irvin Kaiser, Los Angeles; C. W. Coulter, Phoenix, and Fred W. Pabst, San Francisco.

The Western Region—W. J. Rasmussen, St. Louis; Ralph Kreissel, St. Paul; Harvey Wilcox, El Paso; E. J. Wintersteen, Sioux Falls; J. M. Critz, N. Little Rock; C. D. Walker, Denver; S. C. Webb, Fort Worth; R. E. Murray, Butte; Noel V. Wood, Kansas City; Dean Schooler, Des Moines; Fred F. Vincel, St. Louis, and R. C. Greenlease, Kansas City.

The Northeastern Region—Harry L. Lewis, Chicago; A. A. Anders, Philadelphia; W. H. Bumstead, Troy, N. Y.; A. C. Hall, Milwaukee; L. M. Fitch, Manchester, N. H.; A. B. Connelly, Boston; A. J. Dahl, Milwaukee; H. A. Wehmeier, Chicago; Hugh Gallagher, Wilmington, Del.; W. J. Michael, Cleveland; Orrin B. Hayes, Kalamazoo; A. L. Danforth, Boston.

The Southeastern Region—A. D. Anderson, Baltimore; Chip Barwick, Memphis; John E. Smith, Atlanta; W. Reed, Jackson, Miss.; J. W. Kiester, Clarksburg, W. Va.; H. S. Drennen, Birmingham, Ala.; Julian C. Frasier, Richmond; L. P. Stuart, Wash-

ington, D. C.; J. E. Johnson, Durham; Leo Huckabee, Macon; Arthur A. Ungar, Miami; C. L. Alderson, Louisville.

These four councils will, under the present plan serve for a period of six months, at that time a new group will be selected to work with the executive committee group.

Traphagen, Pierce Join Wheels, Inc.

W. E. Traphagen and J. Otis Pierce have joined Wheels, Inc., John F. Creamer, president of Wheels, has announced. Mr. Traphagen, formerly with the B. O. P. organization, will be connected with the service department of Wheels. Mr. Pierce, formerly vice-president in charge of sales for the Brown-Lipe division of the Spicer Manufacturing Co., will go to the Newark branch of Wheels in an executive capacity.

W. & H. Rowland, Inc. Open Chicago Office

William and Harvey Rowland, Inc., Philadelphia manufacturers of automobile springs, have opened a branch sales office at Chicago. James F. Flanagan, formerly with the Burton Auto Springs Co., has been named assistant sales manager in charge of the new office.

Steel Works Jan. 1 On Automotive Orders

Rumored Labor Troubles Have Little Influence on Market; Step-up Output

New Year's Day does not generally rate as a steel mill holiday. Urgent requests from motor car manufacturers and parts makers for as prompt shipments of flat steels, especially of full-finished sheets, caused a good deal of work being done in steel mills on Tuesday.

A considerable volume of business was placed during the latter part of December, specifying a relatively high rate of shipments to be made in January, so as to take care of the speeding up of new model assemblies. Full-finished sheets cannot be turned out over night, as is the case with numerous other steel products. A set number of days are consumed in the various manufacturing stages, and production schedules, therefore, more rigid. Although some short-cuts have been introduced by some mills, sheet mill finishing departments are still the neck of the bottle that acts as limiting factor on production, speeded up as it may be, and specialists in full-finished sheets are certainly pushing output this week. Demand for strip steel has also broadened further.

Makers of cold finished bars are experiencing the pleasant sensation of having to step up their operations for the first time in months. Automotive alloy steels come in for a corresponding share of demand. Bolts and nuts enjoy wider automotive distribution.

News over the New Year's holiday to the effect that further labor complications are in the offing, so far has had no influence on the steel market. Producers as well as large consumers consider the possibility of any impairment of steel output as the result of unionists' activities as a very remote contingency. Like all commodity markets, that for steel, however, will be more or less under the influence of developments at Washington in the next few months.

New Truck Registrations—11 Months

	November, 1934	November, 1933	11 Months 1934	11 Months 1933	Per Cent Change 11 Mos., 1934 over 1933	Per Cent of Total—11 Months 1934	Per Cent of Total—11 Months 1933
Chevrolet	11,296	4,849	149,588	95,993	+ 55.8	39.38	41.69
Ford	8,060	5,524	121,904	57,880	+110.6	32.10	25.13
Dodge	3,868	3,675	43,596	24,834	+ 75.5	11.48	10.78
International	2,626	2,222	29,047	24,718	+ 17.5	7.65	10.73
G. M. C.	886	576	9,695	6,100	+ 58.9	2.55	2.65
Diamond T.	305	333	5,075	3,857	+ 31.6	1.34	1.67
Reo	393	267	4,679	2,782	+ 68.2	1.23	1.21
White	267	82	3,710	1,267	+192.8	.98	.55
Federal	150	115	1,823	1,217	+ 49.8	.48	.63
Mack	116	218	1,732	1,506	+ 15.0	.46	.65
Studebaker	131	117	1,572	1,800	- 12.7	.41	.78
Brockway	79	71	1,143	833	+ 37.2	.30	.36
Autocar	85	142	1,062	1,033	+ 2.8	.28	.45
Indiana	69	95	699	1,181	- 40.8	.18	.51
Stewart	40	49	694	636	+ 9.1	.18	.28
Austin	26	77	450	991	- 54.6	.12	.43
All others	292	279	3,347	3,661	- 8.6	.88	1.60
Total	28,689	18,691	379,816	230,289	+ 64.9	100.00	100.00

New Pierce-Arrow Further Modernized

Conspicuous Refinements
of Interior and Exterior
Design Feature '35 Models

The 1935 models of the Pierce-Arrow Motor Car Co. represent a further modernization of styles. Conspicuous refinements of exterior and interior design include new hood louvres, improved fender skirts, new-type headlamp lenses, a completely new instrument board, special custom tailoring, and a new range of colors.

Additional room has been provided, especially in the front compartment. Other features of the 1935 bodies include airplane-type insulation in the dash, doors and walls; draftless ventilation; more luxurious arm rests; larger instrument-panel compartments; new-type instruments with radio dial panel mounted more conveniently in the instrument group.

The entire line comprises a complete range of body styles in both the Twelves and Eights.

In the eight-cylinder group, Model 845, the engine rating is 140 hp. There are two wheelbases—139 and 144 in. The latter chassis accommodates the seven-passenger and limousine models, and a moderately priced streamlined Silver Arrow creation.

The Model 1245 group, in addition to conventional styles, includes a Silver Arrow model. All are powered with a 175 hp. twelve-cylinder engine. Two chassis lengths

are used in this group, one of 139 and one of 144 in.

The third and most luxurious group in the Pierce-Arrow line is the Model 1255, which embraces body types in strictly conservative and formal modes. This group is also powered with a twelve-cylinder engine of 175 hp. and has a wheelbase of 147 in.

January Schedule

(Continued from page 1)

Ford accounted for approximately 17 per cent, the remainder, or 18 per cent, being accounted for by high schedules, relatively among the independent producers.

As far as the high January totals are concerned, an important factor of course is the quadrupling of Ford contemplated output. With announced schedules averaging 5000 daily, Ford should not be far from the 100,000 mark for the month.

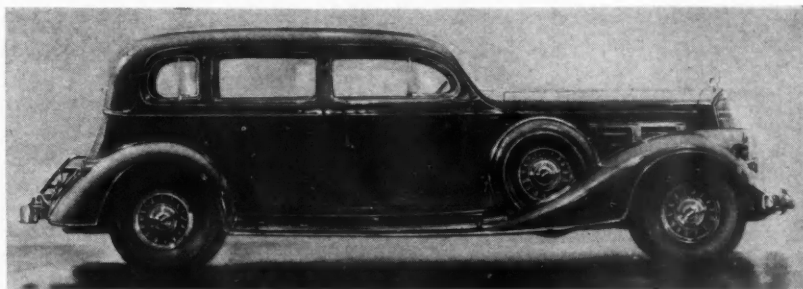
G.M. is expected to pass Chrysler in

production for the month but not by an extremely wide margin, since Chevrolet Master production will not be heavy until after February first, while independents should account for approximately 11 to 12 per cent of the totals.

With the high rate of production established by the industry this year, filling of dealer requirements at a much earlier stage should help materially in leveling off production during the spring months when sales reach their peak, a highly desirable feature from the labor standpoint.

For the week ending Dec. 29 shipment of Plymouth cars totaled 9732 units. This is reported to be the biggest week in the history of the company.

The total Reo output of passenger cars and Speedwagons for the year just ended showed a gain of 66 per cent over 1933 and a gain of 137 per cent over 1932.



Pierce-Arrow 1935 7-passenger Sedan

Business in Brief

Written by the Guaranty Trust Co., New
York, exclusively for Automotive Industries

There was a pronounced improvement in general business last week. Retail trade was stimulated by the colder weather. Christmas business is reported as the best in many years. Steel production increased last week, and the output of electricity was the largest for any week since December, 1929.

Commodity Price Index Rises

The Guaranty Trust Company's index of wholesale commodity prices on Dec. 15 stood at 51.6, as against 50.9 a month earlier and 49.8 a year earlier. The company's index of business activity for November was 65.4, as against 65.3 for the preceding month and 64.1 a year ago. Of the ten adjusted series composing the index, six advanced and four declined. The original figures of steel ingot production and foreign trade advanced contrary to the usual seasonal movement.

Freight Loadings Irregular

Railway freight loadings during the week ended Dec. 22 totaled 547,895 cars, which marks a decrease of 32,040 cars below those during the preceding week, a gain of 16,431 cars above those in the corresponding period last year, and an increase of 53,385 cars above those in the corresponding period two years ago.

Food Prices Falling

According to the Bureau of Labor Statistics, retail food prices continued the gradual but steady decrease during the two weeks ended Dec. 4. The current index stands at 114.6, based on the 1913 average as 100, which marks a decrease of 0.3 per cent below the figure on Nov. 20 and a decline of 1.9 per cent below the high for this year reached last September.

Current Output Gains

Production of electricity by the electric light and power industry in the United States during the week ended Dec. 22 was 7.9 per cent above that in the corresponding period last year.

Employment Steady

According to the Bureau of Labor Statistics, factory employment and payrolls decreased seasonally during November. Employment declined 1.9 per cent below the level in the preceding month and total payrolls fell by 2.5 per cent.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended Dec. 29 stood at 78.7, as against 78.4 for the week before and 78.6 for two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Dec. 26 showed no changes in holdings of bills bought in the open market, bills discounted, and government securities.

Automotive Industry Little Affected By NIRB's Latest Idle Time-Wage Rule

Employees in coded industrial establishments must be paid for idle time occasioned by interruptions of work beyond their control when an employer requires them to be present and ready for work, under provisions of an administrative order announced last week by the National Industrial Recovery Board.

The order lists breakdowns, delays, time spent waiting for materials or for the unloading of railroad cars or other vehicles of transportation, etc., as causes over which the employee has no control.

Apparently the order means that an employee can't be laid off temporarily and asked to return later the same day without pay for the resulting idle time. It is felt, however, that a lay-off around noon for the rest of the day would not be a violation.

While the automotive industry, like other lines, is subject to such unavoidable interruptions of output, particularly when new models are being put into production, the new NIRB order is not expected to mean any change in practice, for the automobile plants in general have been following the policy it established. Whatever scattered instances there have been where criticism on this score has been justified, are believed to have been pretty well taken care of. Management has been giving a great deal of attention to avoiding interruptions, and also the tendency to pay on a day rate basis automatically assures the worker of wages for idle time.

Code Authorities' Duties Outlined in NRA Circular

Plans for placing a trained staff of full-time administration members on national code authorities in the field have been announced by the NRA. Under the plan present part-time administration members are to serve jointly with the full-time administration members as long as necessary. According to the announcement in some cases the part-time members may be authorized to serve instead of full-time members.

The NRA has outlined the duties of full-time administration members of code authorities in a recent circular. These duties as outlined are "to bring to Code Authorities a more intimate knowledge of NRA policies and procedure . . . to bring to NRA Deputy Administrators a more intimate knowledge of the Code Authorities' problems." Each new administration member of a code authority is instructed to keep himself informed with respect to the application of industry in the solution of its problems, of

the objectives of the Recovery Act, the general activities within the industry represented and secure full consideration of the interests of employees, consumers and those engaged in other steps of the economic process.

Wico Promotes Redman

James E. Redman, sales manager of the manufacturers' automotive equipment division of the Wico Electric Co., West Springfield, Mass., has been appointed general sales manager for that company.

Regional Administration Offices Opened by NRA

Regional offices for code administration are to be set up by the NRA. Already offices have been organized in New York and Chicago. Under the direction of D. M. Nelson, code administration director, other regional offices are to be opened in San Francisco, Cleveland, Boston and Philadelphia.

Administration members of national code authorities will operate from these offices, and if needed the Legal, Research and Planning and other NRA divisions and the several advisory boards will assign representatives to the offices.

Tin Plate Co. Changes

Three changes in the executive personnel of the American Sheet and Tin Plate Co. have been announced by C. W. Bennett, president. F. C. Harper, formerly secretary and treasurer, has been elected vice-president and general manager of sales. F. M. Fuller, formerly general manager of sales, has been appointed assistant to the president, and J. I. Andrews, vice-president, voluntarily retires.

NADA Ends Dual Office System With New Home

Headquarters of the National Automobile Dealers Association are being consolidated at 634 N. Grand Avenue, F. W. A. Vesper, president of the association, has announced.

The offices have been divided in the Bell Telephone Building, at 10th and Pine Streets, and the Missouri Pacific Bldg., at 13th and Olive Streets. The former accommodated the general offices and part of the staff, and the latter housed the work of analyzing and compiling the thousands of monthly reports for the Official Guide under the dealers' code.

CALENDAR OF COMING EVENTS

SHOWS

New York Automobile Show.....	Jan. 5-12
Los Angeles Automobile Show.....	Jan. 5-13
St. Louis Automobile Show.....	Jan. 6-12
Cincinnati Automobile Show.....	Jan. 6-12
Washington Automotive Assoc., Automobile Show	Jan. 12-19, 1935
Toronto, Canada Automobile Show,	Jan. 12-19
Newark, N. J. Automobile Show.....	Jan. 12-19
Buffalo, N. Y. Automobile Show.....	Jan. 12-19
Cleveland Automobile Show.....	Jan. 12-19
Milwaukee Automobile Show.....	Jan. 12-19
Detroit Automobile Show.....	Jan. 12-19
Springfield, Ill., Automotive Show,	Jan. 13-20
Brooklyn, N. Y. Automobile Show.....	Jan. 14-19
Philadelphia Automobile Trade Assoc. —Automobile Show	Jan. 14-19
National Motor Boat Show, New York	Jan. 18-26
Toledo Automobile Show.....	Jan. 18-24
Columbus, Ohio Automobile Show	Jan. 19-24
San Francisco Automobile Show.....	Jan. 19-26
Boston Automobile Dealers Assoc. —Automobile Show	Jan. 19-26
Pittsburgh, Pa. Automobile Show,	Jan. 19-26
Hartford, Conn. Automobile Show.....	Jan. 19-26
Syracuse Automobile Show	Jan. 19-26
Nashville, Tenn., Automobile Show	Jan. 20-26
Baltimore—Automobile Show	Jan. 21-26
Rochester Automobile Show.....	Jan. 21-26
Lansing Automobile Show.....	Jan. 22-27
Chicago Automobile Show.....	Jan. 26-Feb. 2
Montreal, Que., Automobile Show	Jan. 26-Feb. 2
Springfield, Mass. Automobile Show,	Jan. 28-Feb. 2
Lancaster Automobile Show.....	Jan. 29-Feb. 2
Harrisburg Automobile Show.....	Jan. 30-Feb. 2

Omaha Automobile Show.....	Feb. 3-9
Wilmington, Del., Automobile Show,	Feb. 3-9
Kansas City, Mo. Automobile Show	Feb. 9-16
Denver, Colo. Automobile Show.....	Feb. 10-23
Peoria, Ill., Automobile Show.....	Feb. 13-17
Bethlehem, Pa., Automobile Show	Feb. 18-23
Evansville, Ind. Automobile Show.....	Feb. 23-27
Minneapolis Automobile Show.....	Mar. 9-16
Mankato, Minn. Automobile Show	Mar. 16-23

MEETINGS

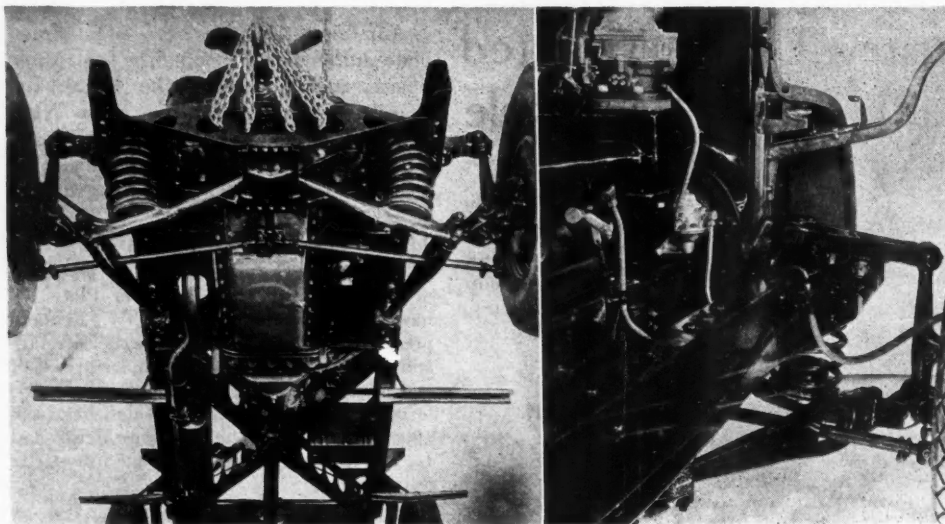
Automobile Trade Association Managers Midwinter Meeting—New York....	Jan. 6
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ANNUAL MEETINGS

Society of Automotive Engineers—Annual Banquet—New York	Jan. 7
Motorcycle & Allied Trades Assoc., New York City	Jan. 9
Overseas Automotive Club Annual Show Luncheon, New York.....	Jan. 10
American Engineering Council, Washington, D. C.	Jan. 10-12
Society of Automotive Engineers—Annual Meeting—Detroit.....	Jan. 14-18
American Roadbuilders Assoc., Washington, D. C.	Jan. 22-25
Automotive Parts & Equipment Mfrs., Inc.—Chicago	Jan. 29

CONVENTIONS

National Automobile Dealers Assn., Detroit	Jan. 14-15
Lafayette, Ind. (Purdue University), Automotive Service Conference,	Mar. 21-22



(Left) Worm's-eye view of Packard independent suspension with wheels dropped to show construction

(Right) Chassis detail showing further construction of the Packard independent suspension including the torque arm on the right side. Note also steel radiator and fender harness fulcrum mounted at bottom center of radiator core

The New Packard 120 Series

ONE of the very few entirely new cars at the New York Show will be the long-heralded, lower-priced car of the Packard Motor Car Co., the Packard 120. It is distinctive in appearance, and the body pictures reproduced herewith tell their own story in this respect.

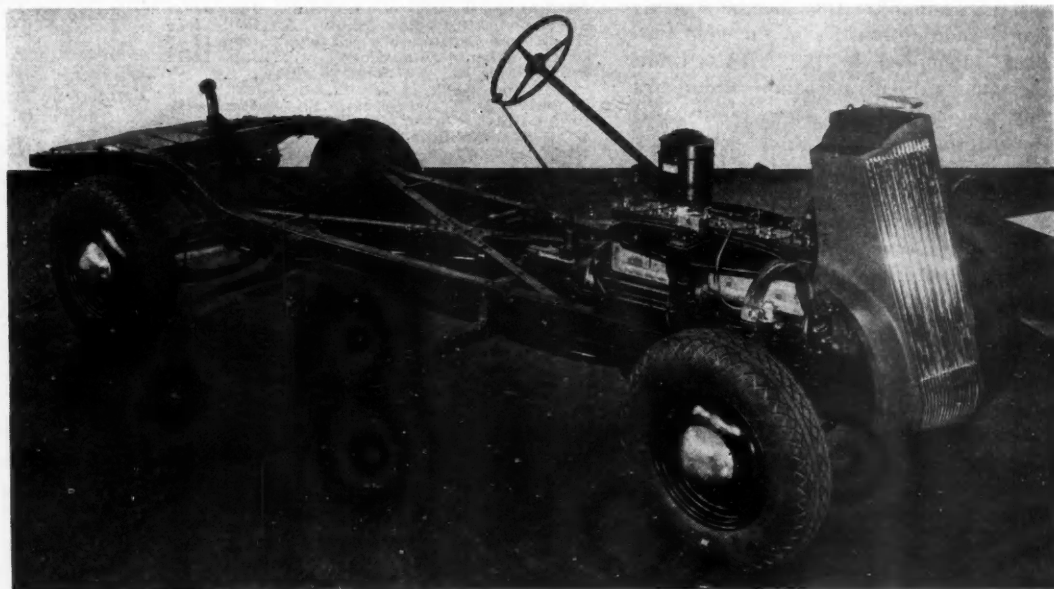
The most outstanding mechanical feature of this new 120-in. wheelbase, 110 hp. model would appear to be the coil-spring independent suspension, which differs from other designs of this type. The powerplant comprises an eight-cylinder in-line L-head engine of large displacement and of completely new design, together with a "semi-

centrifugal" clutch and an all-helical, synchronized transmission of Packard manufacture. Other design features include needle-bearing universals, an "angle-set," hypoid-drive rear axle, a sturdy X frame, hydraulically-operated duo-servo brakes, relatively low-pressure tires on 16-in. wheels, a solenoid-operated starter switch, 17-plate batteries, a fuel compensator on the distributor, a fan-cooled generator, automatic choke and inlet-temperature controls, a 20-gal. fuel tank, metered connecting-rod lubrication, a rigid crankshaft, aluminum-alloy pistons, three-point engine mounting on rubber, a cylinder head of novel design with

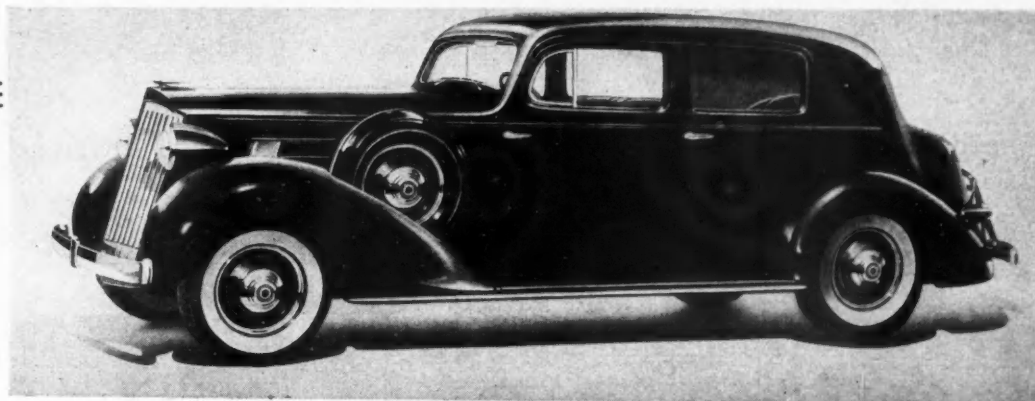
a compression ratio of 6.5, exhaust valves of austenitic heat-resisting steel, cylinder bores water-jacketed over their full length, an auxiliary water distributor for cooling exhaust-valve seats, and thermostatic water-temperature control.

With a curb weight of roughly 3700 lb. for the sedan, the weight/power ratio is 33 lb. per hp., and the car is said to have a top speed of close to 90 m.p.h. The acceleration also is high, and the speed can be increased from 5 to 30 m.p.h. in 8½ sec. This is due to the high torque of the engine, which exceeds 200 lb.-ft. for the speed range 1200-2200 r.p.m. The maximum out-

Chassis view showing the frame of the Packard 120. Note long rear X-member legs



Five-passenger club
sedan with de luxe
equipment



A lower-priced line with 110 hp. eight-cylinder engine in 120-in. wheelbase chassis having coil spring front suspension; sedan weighs about 3,700 lbs.

put of 110 hp. is developed at 3800 r.p.m., which corresponds to a car speed of roughly 75 m.p.h.

The engine has a bore of $3\frac{1}{4}$ in. and a stroke of $3\frac{3}{8}$ in., making its displacement 257 cu. in. Tests on the Packard Proving Grounds are said to have shown fuel mileages ranging from 21 per gallon at 20 m.p.h. to 12.5 at 70 m.p.h. At 50 m.p.h. 16.4 miles can be covered per gallon, and at 40 m.p.h., 17.5. The same tests also showed the oil consumption to be relatively low, varying from one gallon per 4000 miles at 30 m.p.h., to one gallon per 700 miles at 70 m.p.h. The low consumption figures are ascribed by the manufacturer to low friction losses, high compression, and the fact that owing to the large displacement of the engine the carburetor operates within the "economy range" even at relatively high road speeds.

The accompanying drawings show details of the new engine. Special attention may be called to the heavy crankshaft ($2\frac{3}{4}$ -in. diameter) with "overlapping" journals, fully counterweighted; the cylinder block extending some $2\frac{1}{2}$ in. below the crankshaft axis, and heavily ribbed for rigidity; the chain camshaft drive, the spring-loaded, rubber bonded vibration damper, the rifle-drilled connecting rods, metering holes for oil in the crankshaft to ensure an adequate supply of oil to all bearings regardless of the state of wear of same; thin-walled, steel-backed, babbitt-lined bearings for connecting-rod lower ends as well as mains; three compression and one oil ring per piston; individual exhaust ports for each cylinder, provid-

ing ample water-jacket space at the exhaust valves; the previously mentioned water distributor for jet-cooling of the cylinder blocks near the exhaust-valve seats; the large oil pump, drilled oil leads, and cast valve-tappet guides.

Additional engine-design features include the new head which, it will be noticed, has a low clearance over the exhaust valve to increase the breathing capacity of the intake valve and also to assist in combustion-chamber cooling. This design of head lowers the rate of combustion and permits higher compression.

The intake manifold is of the down-draft type, with a large heat-insulating block between the riser and the dual carburetor, as a safeguard against vapor lock. Note also the drain provided, piped to below the engine pan, which drains the manifold when it is loaded with fuel.

A combination suction and forced-draft type crankcase ventilating system is built into the engine. The water pump, of large capacity, forms a unit with the 4-blade 16-in. fan. The cooling-system thermostat has a by-pass to maintain continuous water circulation during the warming-up period.

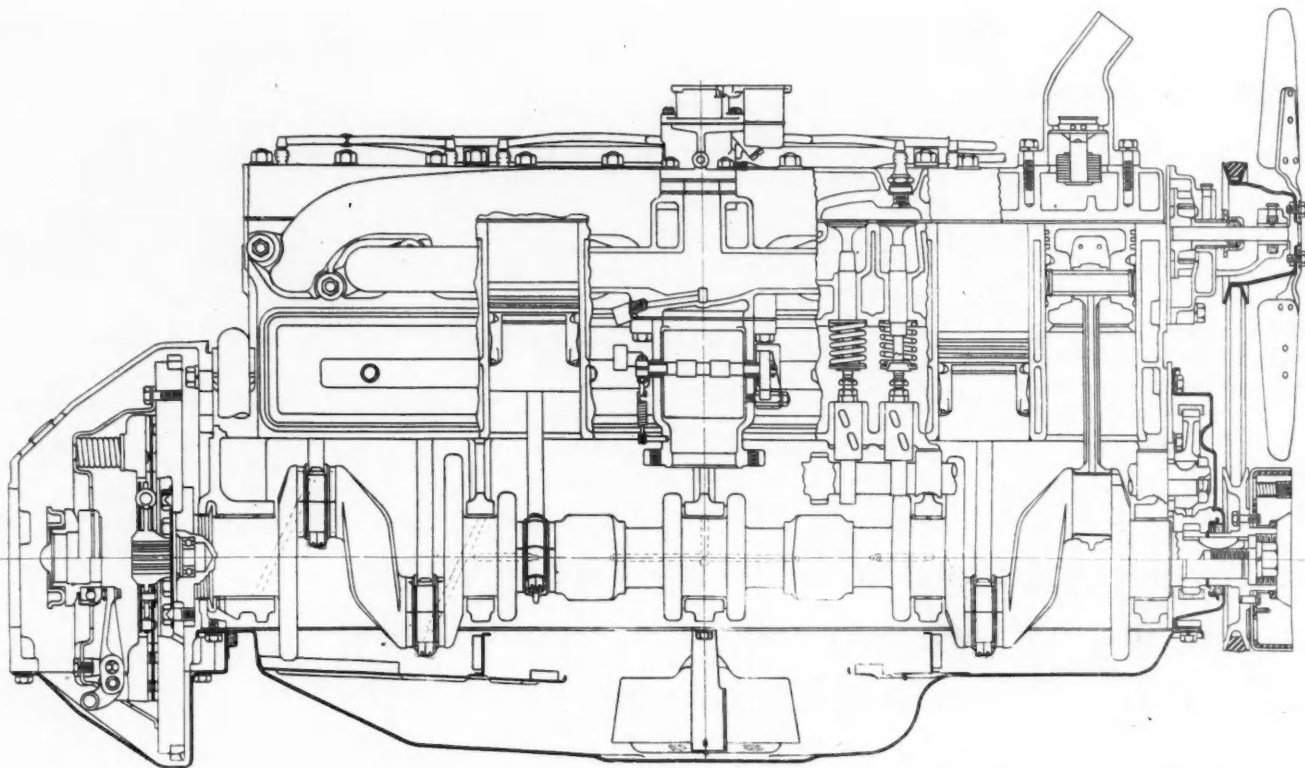
The automatic choke is built into the Stromberg carburetor, except for the thermostatic element, which is recessed in a vented pocket in the manifold. The heat-control thermostat is located in the central outlet riser of the exhaust manifold. A combination of air cleaner and intake silencer is standard equipment.

There are two points of support for the powerplant at the rear, one on

each side of the transmission case—and a central one in front, all three being of the rubber-insulated type. The mufflers are of the acoustic type.

The Auto-Lite electrical equipment comprises a generator having a charging rate of 23 amperes, with voltage regulator and fan cooling; a double-breaker, four-lobe cam distributor provided with manual adjustment for the initial distributor setting to correspond with requirements of different grades of fuel used; and a starter motor with solenoid switch and Bendix engagement.

Incorporation of centrifugal weights in the clutch materially reduces the pedal pressure required to release the clutch at low engine speeds. Comparatively light springs are used, and with the engine at rest it requires only 23 lb. pressure on the pedal to release the clutch. As the engine is speeded up, the centrifugal weights assist the springs in pressing the clutch disks together, with the result that the pedal pressure required for the clutch release is increased roughly 10 per cent at 1000 r.p.m., 20 per cent at 1500 r.p.m. and 35 per cent at 2000 r.p.m. Of course, the pedal pressure required continues to increase beyond that speed, and becomes about 53 lb. at 80 m.p.h. However, the clutch is released most frequently at low engine speeds so that the incorporation of the centrifugal mechanism, which reduces the initial pressure from a normal of 35 lb. required to take the full engine torque, to 23 lb., is a definite gain. Besides, lowering of the slipping torque of the clutch at low engine speeds, should make for smoother engagement, by per-



Partial section of new Series 120
Packard engine

mitting some amount of clutch slip if the clutch is let in too rapidly. It will also be noted from the illustrations that the clutch housing is provided with ventilating openings.

Gears in the all-helical transmission are carburized. Anti-friction bearings are used throughout, except for the reverse idler, there being roller bearings on the countershaft and ball bearings in the second-speed idler. The synchronizer is of the ball-detent type and is said to have exceptionally large "braking" capacity. The mainshaft is cut with helical splines for the low-speed-and-reverse sliding gear.

Needle-bearing universals are sealed permanently in assembly and do not

require lubrication attention in service. Hypoid rear axles have been mentioned. Brakes are similar to Packard's mechanical brakes on other and previous models, with a hydraulic piston replacing the usual operating cam. Hose lines from the master cylinder near the brake pedal are carried inside the frame side rails for protection. In addition, there is a mechanical linkage from the inverted emergency lever under the dash to the rear brakes through a short cross-shaft. Drums are Centrifuse and are provided with dust shields.

Disk wheels are of 16-in. diameter and highly crowned for anti-resonance. They carry 6.50-in. tires designed for

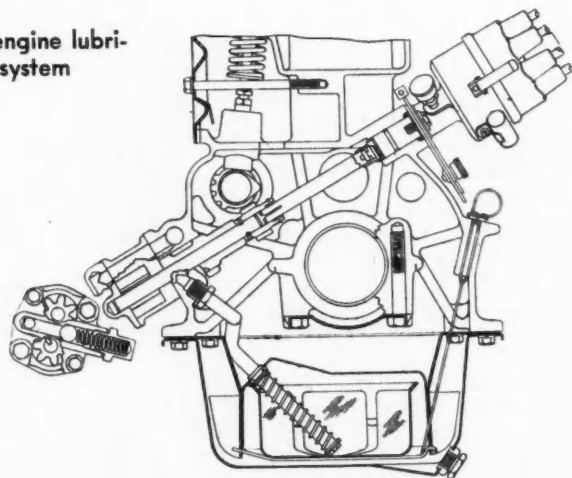
26 lb. inflation pressure. Frames look amply strong. The rear legs of the X members are quite long, the kick-up starting in these legs before they join the side-rail and from the junction whence they continue to the rear as a reinforcement, spot-welded into the rail. Front legs of the X-member are carried forward to form a box section with the side-rail and are anchored to the front cross-member. Parallel braces tie the rear cross-members together to form a gas-tank support. Step hangers are individually braced. There is a cross-member also at the rear of the engine and there are braces between the side-rails and X-sub-frame members.

Packard's independent suspension is of the link-parallelogram type but differs materially from other designs of the same classification in that the upper guide links between the frame and steering head are not required to take torque loads and loads on the wheels parallel with the axis of the car.

The upper link to the steering head, which is of wishbone form because it forms the shock absorber arm, is rubber-bushed at the steering head, so as not to take brake torque. This arm merely serves to locate the upper end of the steering head and to transmit shock-absorber loads.

From the lower end of each steering head a single, forged transverse arm extends to a reinforcement plate under

Details of engine lubrication system



the center of the front cross-member. These are the main load-carrying arms, the coil springs being located between them and the chassis frame.

Rigidly attached near the outer ends of the load arms are torque arms, one on each side, projecting rearward and anchored in rubber mountings to the frame side rail a little ahead of the dash. These take all the torque load. Their use is said to materially reduce the tendency of the nose of the car to dip on brake application.

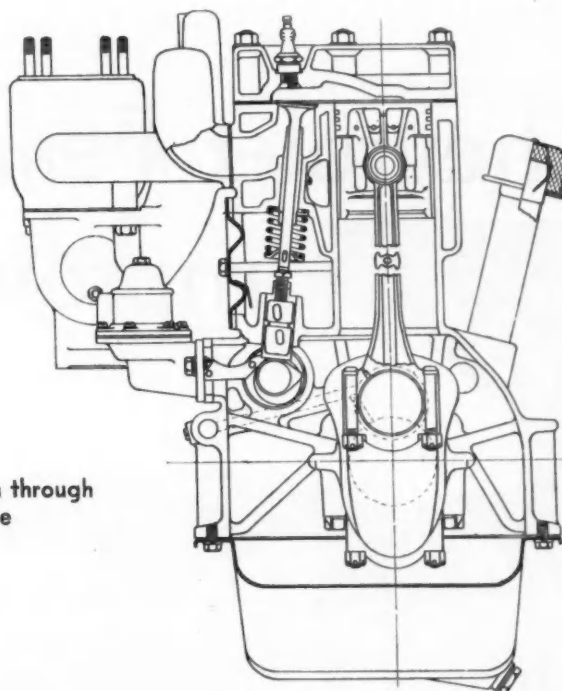
The lower arm connects to the steering head through a needle bearing, and a ball bearing is provided to take thrust.

With this suspension, the wheel recedes slightly while rising above or dropping below its central position, in which respect the effect is contrary to the trailing action which is a feature of other, generally similar suspensions. Caster variations are small, however, since the design incorporates a long torque arm controlling this. The use of rubber bushings in both upper and lower links is said to have the effect of softening the suspension materially, particularly the boulevard ride.

The spring rate is 90 lb. per in. of deflection in the central position and builds up to a maximum due to a rubber bumper inside of each coil spring to prevent metal-to-metal contact. Rear springs on the sedan models have a rate of 120 lb. per in. The low front-spring rate is due in part to the fact that the engine is located well forward of the chassis, extending ahead of the wheel center. With the body and seats also farther forward than usual (the rear of the engine is pocketed in the dash), there is only about 150 lb. more load on the rear than on the front springs.

The geometry of the suspension appears to work out well. For a 4-in. wheel deflection the tread varies only 1/16 in. and the camber less than 1 deg. With the low spring rates mentioned, considerable body roll might be anticipated. Its absence is credited to the geometry of the suspension rather than

Cross-section through engine



the use of a rather light torsional stabilizer at the rear of the car. At high speed the body has a tendency to "sway" rather than "roll" on curves, and the stabilizer is incorporated mainly to overcome a tendency to oversteering under these conditions. Steering is through a central intermediate steering arm, with an individual tie-rod to each knuckle. The gear is of the worm-and-double-roller type, with a ratio of 18.4 to 1, the overall ratio being 20.5 to 1.

Camber adjustment can be made by means of an elongated hole and three interchangeable pieces in the fitting of the shock absorber link at the steering head (five selective adjustments possible). There is no adjustment for caster, the steering not being affected by minor variations of caster.

Rear springs are provided with metal covers to retain graphite lubricant in-

troduced during assembly. At the front end they are shackled in rubber, while at the rear there are shackles of the threaded type, with reservoirs to retain lubricant.

Fenders, radiator and headlamps are fulcrum-mounted at the center on a single rubber support, so that these units are anchored to the body (through the radiator brace rods) rather than to the frame, for front-end steadiness.

Bodies are largely of steel construction, the pillars, cowl and rear-compartment floor all being of steel. Body sills, roof rails and roof bows are of wood, however, for quietness. The front-compartment floor is also of wood. Twenty-four body bolts are used. All doors are hinged at the rear. There is considerable "tumble-home," and rear-quarter panels are curved in toward the rear to give the car a narrower, sloping-tail appearance.

The Mechanical Equivalent of Heat

WHILE the original definition of the British thermal unit was "that amount of heat which is required to raise the temperature of one pound of water from 39 to 40 deg. F.," this is no longer official. At the International Steam Table Conference which was held in London in 1929 the calorie—formerly the amount of heat required to raise one kilogram of water one degree Centigrade in temperature—was defined as equal to 1/860 kilowatt-hour. Since there is a definite ratio between the British thermal unit and the calorie (the latter being 3.969

times the former) this fixes the magnitude of the British thermal unit. Taking account of the ratio between the kilowatt-hour and the erg, (the unit of energy of the centimeter-gram-second system), between the erg and the kilogram-meter, and between the kilogram-meter and the foot-pound, it is found that under the new definition the British thermal unit is equal to 778.26 ft.-lb.

In this connection it is interesting to recall that the first rough determinations, after the interconvertibility of heat and mechanical energy had first been established, gave 1034

(Rumford) and 666 (Mayer) for the mechanical equivalent of heat in British units. Joule's experiments, based on a good many different principles and carried out in England between 1839 and 1850, gave a value of 772, which was used by engineers for a good many years. Professor Henry A. Rowland of Johns-Hopkins University, Baltimore, in 1887 carried out experiments by the paddle-wheel method in which the mechanical equivalent of heat was found to be 778.2, a value remarkably close to that now standardized by the Steam Table Conference.

Chevrolet Features New Body S

Improved Performance



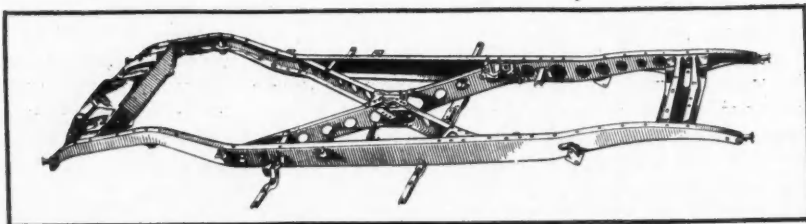
Two-door Chevrolet Master, showing new fenders, clean appearance due to all-steel roof, V-windshield and increased front-roof-panel curvature

NEW bodies and styling of the Master or "De Luxe" models and greatly improved performance of the Standard line—these are the main points in the 1935 announcement of the Chevrolet Motor Company. Whereas last year the two Chevrolet chassis models were identical in general appearance but differed greatly in performance, the Master having the advantage in the latter respect, this year the two cars differ radically in appearance but are nearly on a par with each other as regards performance, though the Standard excels slightly in respect to hill-climbing ability and acceleration. Economy of operation will be a major sales point for both lines.

The major developments in the two lines are as follows: Adoption of the Master engine and clutch in the Stand-

Body Changes on the Chevrolets

Windows with more rounded corners.
Doors extended below the floor, with rounded corners at the top.
Belt moulding widening from the hood at the doors and then tapering toward the rear.
More sharply angled ($31\frac{1}{2}$ deg.) vee-shaped windshield, fixed in place and with a center chrome-plated strip.
Windshield wipers mounted below the glass, with provision for a second wiper for the right windshield.
Metal window channels of polished steel.
Brass bushings for door hinges.
Narrower and more sloping radiator grille.
Safety glass in windshield and ventilators.
New instrument panels.
Recessing of the front seats for additional rear compartment leg room and to provide a built-in foot rest.
Pressed-steel wheels are standard equipment on Sedans, wire wheels on other models.



New X-type frame of the Standard model

Styles on Master and on Standard Models

ard chassis, with only minor differences in the two engines for 1935; development of new bodies for the Master, with such features as one-piece steel roofs, vee-shaped windshields, more sloping tails, and increased leg room, the latter having been obtained by lengthening the wheelbase 1 in., to 113 in., and moving engine and body ahead 1½ in.

Numerous refinements and improvements have been made throughout the chassis. For instance, the crankshafts are now 90 per cent counterweighted, to reduce bearing loads; a new pressure, jet system lubricates the crankpin bearings at higher speeds; tin-plated pistons are used. A new clutch-plate design is a feature of both lines; brakes have been made more effective, particularly on the Standard line; an X-frame is found on the Standard.

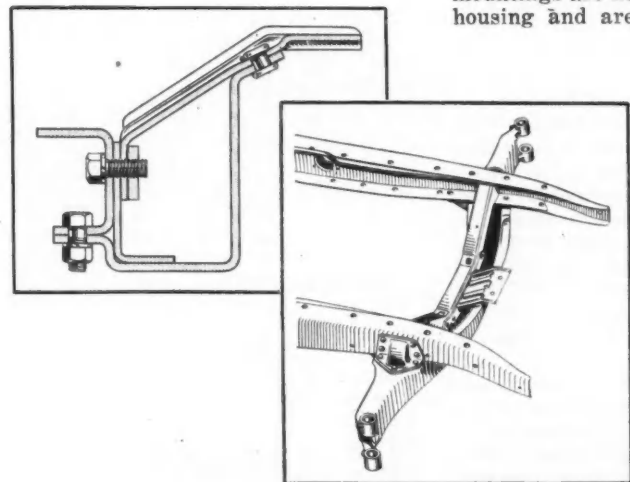
Knee-action suspension of the Dubonnet type is retained on the Master models, with only minor detail refinements found desirable. The ride is

said to have been further improved by moving the engine farther ahead. On the Standard the conventional semi-elliptic leaf spring suspension is continued.

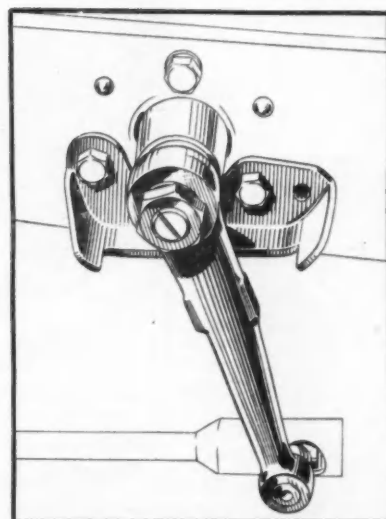
Body lines on the Standard are the same as those of the new Standard four-door sedan recently announced. As compared with the previous Standard, the bodies are roomier.

The new crankshaft, which is 5 lb. heavier than the one previously used, together with the harmonic balancer, flywheel assembly and clutch plate are selectively assembled so that slight unbalances in the individual parts are neutralized in the assembly. In this manner the total unbalance of all rotating parts is kept down to one inch-ounce.

Engine supports have been completely redesigned. There are two points of support centrally in front, on rubber vulcanized in a box-shaped retainer and with steel reinforcements, located in such a manner that the support can flex side-ways only and not fore-and-aft of the engine. The inclined side mountings are now located at the clutch housing and are softer. At the rear



Frame detail on the Master showing strengthened king-pin support cross-member



Chassis detail showing new frame bracket providing definite stops for pitman arm travel in swinging wheels left or right

there is a cushioning support between the transmission and a special cross-member of the frame.

The new crankpin-lubricating system is a combination of splash and pressure. At low engine speeds the dipper picks up oil from the crankpan troughs. As the engine speed increases and the pressure in the circulation system with it, a valve in the line to the main bearings opens and permits oil under pressure to be forced through tubing in the crankpan. This leads to a series of jets so located that oil from them impinges on the connecting rod dippers at high velocities, filling them and forcing oil into the crankpin bearings. The latter have deeper oil grooves, to take care of the greater volume of oil supplied. The capacity of



New Chevrolet Standard Six coupe

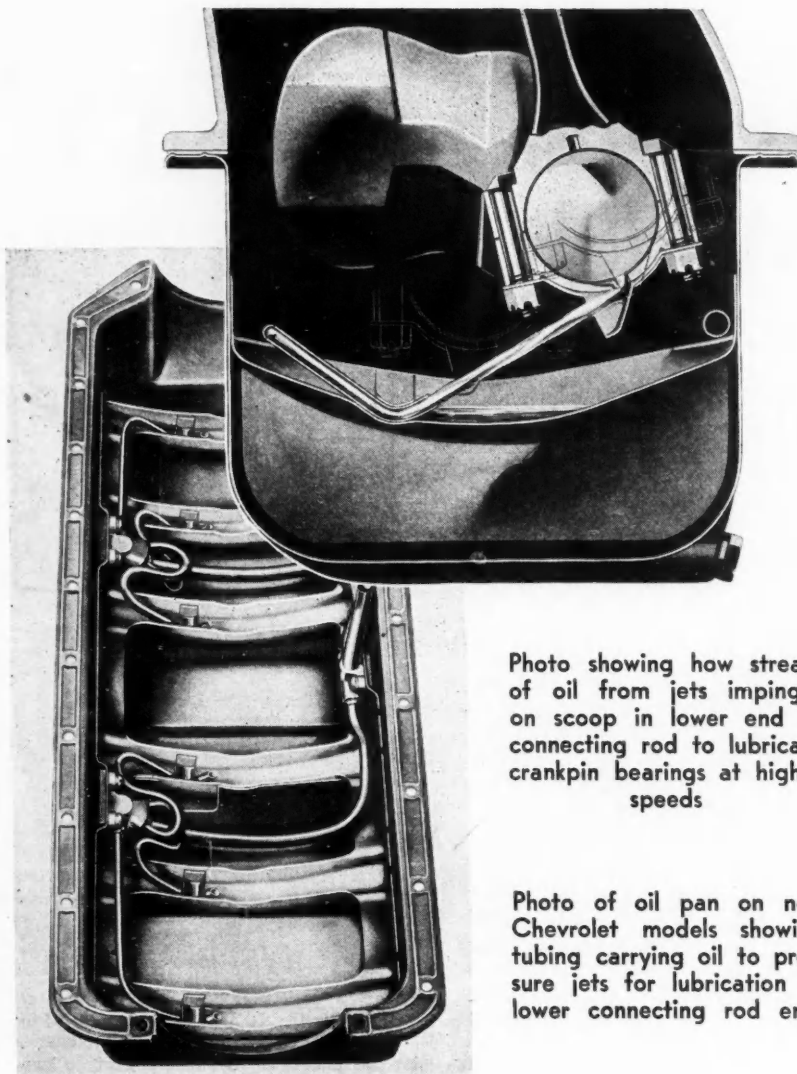


Photo showing how stream of oil from jets impinges on scoop in lower end of connecting rod to lubricate crankpin bearings at higher speeds

Photo of oil pan on new Chevrolet models showing tubing carrying oil to pressure jets for lubrication of lower connecting rod ends

the oil pump has been increased 60 per cent by increasing the height of the rotor, and larger oil distributor leads are provided.

Specifications indicate that intake valve ports have been given a venturi form, being smaller in diameter at the throat. This change was made to increase the velocity of flow at this point, which is said to result in a higher volumetric efficiency and increased output and economy.

Pistons of the 1935 Chevrolet engines are tin-plated, the same as those of other G. M. lines, which shortens the breaking-in period. By widening the grooves in the oil ring, the unit pressure of the ring against the cylinder wall is increased and the oil consumption reduced.

The camshaft rear bearing now has a rolled bushing, babbitt-lined, steel-backed, and 1½ in. long. It is lubricated under pressure from the rear main bearing.

The cooling water is now circulated more rapidly at low speeds, which tends to a more nearly even temperature throughout the engine. Special provision is made for the installation of car heaters, by providing tapped holes in

the water pump body and the side of the cylinder head near the front. This location is chosen because the water there is some 10 degrees hotter than at the rear of the cylinder head, where the connection was formerly made. In view of the increased rate of flow, the water outlet has been made larger, being now 1½ in. in diameter. There are two outlet hoses, each 4¼ in. in length, and a single inlet hose, 6½ in. in length.

Improvements in the Delco-Remy distributor reduce the rate of wear. Governor weights and cams are thicker and harder, the weights are machined instead of being stamped, and the case serves as a stop for them. A. C. No. K-11 spark plugs are standard equipment. An anti-rattler spring has been

Front wheel support bearing detail showing Welch plug with snap ring permitting high pressure lubrication at this point (On Master models)

added to the heat control valve for intake gases.

Ignition coils, formerly located on the dash, are now mounted on the distributor side of the cylinder block, which reduces the length of the high-tension lead to 5½ in. The principal object of this change is to reduce radio interference.

The coil-ignition lock is retained.

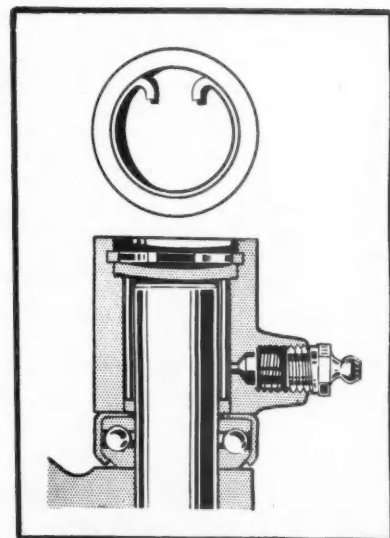
Direct radiation from the engine—and particularly from the crankcase—has been increased by the provision of new engine pans braced from the side rails, which also afford additional protection against mud and dust. The air outlet at the rear has been increased in size.

There is a slight difference in the ratings of the engines for the two models, which is attributable mainly to differences in manifold size and carburetor setting. The Standard installation being designed for maximum economy. The Standard engine has a rating of 75 hp. at 3200 r.p.m. and of a maximum torque of 150 lb.-ft., while that of the Master engine is 80 hp. at 3300 r.p.m. and a maximum torque of 155 lb.-ft.

The new clutch is said to be decidedly smoother in operation. The pressure plate has five T-shaped segments, which latter are waved in stamping, so that there is a cushioning action during engagement. The design permits the use of facings with a higher coefficient of friction, which facings have longer life.

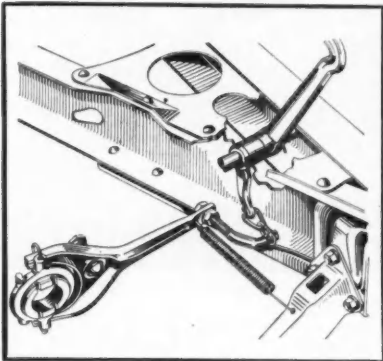
The initial load on the pull-back spring has been reduced to 10-lb., for lighter initial clutch pressure. This has been made possible by the adoption of a new linkage consisting mainly of two chain links between the clutch pedal and the throwout yoke. This type of connection reduces friction and the transmission of vibration from powerplant to body.

Transmissions for Master and Standard are still distinctive, the Standard transmission being continued with improvements to care for the increased power and torque of the bigger engine.



However, except for the clutch gear, the gear sizes are not changed.

Brakes on the Standard now are provided with linings having a higher coefficient of friction. The braking area has been increased by widening the shoes. Full contact of the reverse shoe during engagement is claimed for both the Master and Standard models as the result of a limitation of articulation for this shoe. This is obtained by providing a pin in the web of the shoe engaging with clearance holes in the articulating links, to prevent lifting at the heel. Brake levers on both models are now mounted on the frame instead of on the transmission, making them unaffected by powerplant vibrations and movement.



Clutch pedal linkage friction has been reduced by substituting a chain of two links for a rod connection. This shows Master installation. The Standard is similar generally but differs in detail

In addition to these developments, the Standard model carries an entirely new frame, of the X-member type, with the sub-frame legs forming box sections with the forward ends of the side rails and double channel sections at the rear kick-up. Separate reinforcements are provided in the side rails at the kick-up. Body bolts have been increased to 12. It is claimed that the frame has 12 times the torsional stiffness of the 1934 design. Side rails have a maximum depth of 5-9/32 in., a flange width of 2-1/16 in. and stock thickness of 7/64 in. The X-members have a 5-1/16 by 1 1/2 by 3/32-in. channel section.

Exhaust silencers on the Standard are similar to those on the 1934 Master design, and larger than previously. In these silencers the exhaust gases pass through to the far end, double-back to a resonance chamber at the front end, and then pass on through a third pipe and out through the tail pipe. A system of interior louvers is claimed further to reduce the exhaust noise. The silencer is mounted much closer to the engine, being located between the front and rear legs of the X-member. At the front of the silencer there is an interesting seal, composed of eight layers of steel-reinforced asbestos, ce-

mented together. The same design was adopted on the Master models during the 1934 season.

Bodies of the Standard line have more sweeping rear panels than the earlier 1934 models. They are strengthened by the addition of steel braces from the sills to the belt under the rear window. Adjustable braces are built into the doors.

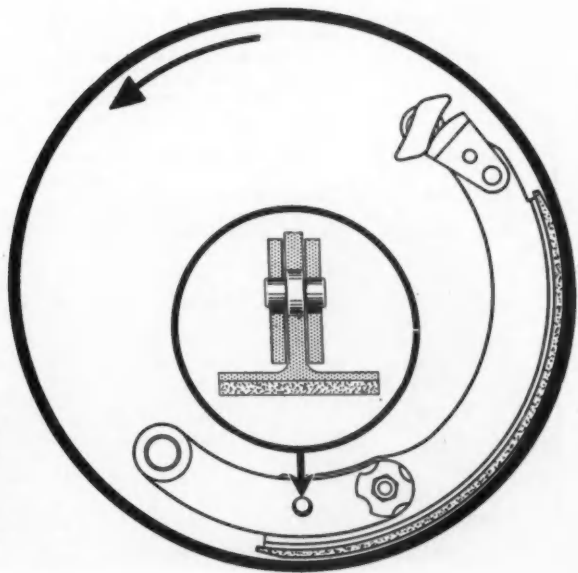
Two models have been added to the Standard line, a four-door sedan and a sedan delivery for light commercial use. The former coach, business coupe, phaeton and sport roadster are continued. Bodies are 3 1/4 in. longer, with 2 1/2 in. more leg room in the rear compartment. The latter compartment now also has flat floors, made possible by a forward shift of the body. Driver's seats in all closed models are now quickly adjustable. Other changes include new instrument panels, foot rests built into a recess in the front seat, recessed rear arm rests, a forward opening, screened cowl ventilator, and greater accessibility of the battery.

Detail changes have been made in the knee-action mechanism on the Master chassis. These are largely along the lines of eliminating oil leaks and increasing durability. Ride control is said to be improved by changes in the shock absorber valves, including increased valve spring pressure, giving more rebound control.

Inner ends of wheel-support-arm shafts are increased in diameter, and their needle bearings have more rollers. Wheel spindles have been shortened slightly, to bring the hub caps closer to the wheels. The needle bearings at both ends of the king pin have been lengthened 7/32 in. The Welch plug over the end of the king pin is reversed and provided with a lock ring, so that when a lubricant is forced into the bearing under high pressure, it flattens the plug and improves the seal.

In the steering gear the pitman arm shaft and bushing have been increased in size, the latter being 1/8 in. larger in diameter and 1/8 in. longer. The pitman-shaft bearing is lubricated from the gear housing, and a cork seal is provided at the outer end of the shaft to prevent leakage. An increase of 1/8 in. in the diameter of the roller sector thrust screw reduces the frequency of need for adjustment for end play. A

Brake details on 1935 Chevrolets, showing new method of anchoring reverse shoe to limit articulation and increase contact effectiveness



definite stop in the form of a frame bracket is provided to limit the travel of the pitman arm. The steering ratio is increased to 17.5, but owing to changes in the linkage the over-all ratio remains unchanged.

The frame of the Master is wider than formerly, and somewhat lighter, but its rigidity has been increased, particularly by a new front cross-member carrying the steering heads. This cross member minimizes operating changes in camber and caster. Additional stiffness has also been provided at the dash and over the rear axle. The top of the frame is 3/4 in. lower, and changes in the body mounting bring the floor and seats one inch lower than last year.

Master deluxe bodies are new both in structure and in appearance. The front structure of each body, to which the cowl panel is welded, consists of an inner cowl, an instrument panel, front pillars, and a windshield header panel with braces, all welded into a single unit. The one-piece-roof stamping extends from the top of the windshield at the front to a point part-way down the rear panel, including the entire rear window opening. Roof side panels, including the drip moulding, are part of this stamping. The roof is reinforced with steel bows anchored at the sides to roof rails of hard wood. There are four of these bows in the five-passenger models and three in the coupes. The under body is also a single steel stamping. Heavy layers of felt "deadener" are inserted between the roof bows and roof panel. This deadener is cemented to the roof panel and serves both as a heat insulator and a drumming preventative.

Master deluxe body models include a sedan, a coach, a business coupe with luggage compartment, a sport coupe with rumble seat, a sport sedan, and a town sedan, the latter two having integral trunks with concealed spare-wheel mounting.

New Six Puts Graham in

Wheelbase	111 in.
Engine	3 x 4 in., L-head six, 169.6 cu. in. displacement, developing 60 hp. at 3500 r.p.m. with standard compression ratio of 5.8.
Pistons	Strut-type Bohn aluminum with one 3/16 in. oil ring and two 1/8 in. compression rings. 13/16-in. diam. piston ring is locked in rod.
Connecting Rods	Center-to-center length, 7 in.; lower bearing replaceable type. Counterbalanced.
Crankshaft	Four steel-backed babitt bearings, all 2 1/4 in. in diam. and of following lengths: 1 7/32, 1 1/2, 1 1/2 and 1 7/8 in. Crankpin, 1 15/16 x 1 15/16 in.
Timing Drive	Chain, 1-in. width, no adjustment.
Valves	Intakes, chrome-nickel steel; head, 1 33/64 in. overall; lift, 9/32 in.; seat angle, 30 deg. Exhaust-stainless steel, 1 13/64-in. overall; lift, 9/32 in.; seat angle, 30 deg. Valve timing; Intake opens 2 deg. BTC, closes 42 deg. ABC; exhaust opens 42 deg. BBC and closes 8 deg. BTC.
Lubrication	Pressure to mains, crankpins, tappets, camshaft, and timing chain. Gear pump.
Fuel system	Stromberg 1 1/4-in. downdraft carburetor fed by AC camshaft pump from 12 gal. tank. Automatic heat adjustment, AC air cleaner and silencer.
Cooling	Circulation by belt-driven pump. Thermostatic temperature control.
Ignition	Delco-Remy distributor mounted above block. Vacuum and inertia governor advance control. 18-mm. Champion plugs.
Starting-Lighting	Delco-Remy. Starter has manual shift. Generator belt driven. Battery 86 amp-hr. Willard.
Clutch	Illinois dry-plate with spring-cushioning in hub.
Transmissions	Warner, second speed and constant mesh gears helical, synchronized shift. Main shaft carried in ball bearings, with roller bearing on pilot. Countershaft and reverse idler in bronze bushings. Ratios direct, 1.661, 2.832 and reverse 3.766.
Universals	Spicer, with needle bearings.
Front Axle	Spicer I-beam.
Rear Axle	Spicer with Timken bearings.
Steering	Cam and lever.
Tires	17 x 5.25 in. Wheels Kelsey artillery.
Springs	Front, 38 x 1 3/4 in. shackled at front. Rear, 50 x 3/4 in. Eaton rubber-cushioned shackles.
Brakes	Hydraulic operating on 9 in. manganese-steel drums. Lining width, 1 3/4 in. Parking brake operates rear shoes mechanically.
Frame	X-type with 5 1/2 in. side rails of 1/8 in. stock.
Tread	56 1/2 in.
Shock Absorbers	2-way Spicer, direct-acting.



The new Graham Six Sedan

GRAHAM-PAIGE bids for a share of 1935's low-priced market with a brand-new 111-in. wheelbase model with a 6-cylinder, 3 by 4-in. L-head engine of 169.6 cu. in. displacement which develops 60 hp. at 3500 r.p.m. The four-door sedan in this line, which is designated as the Standard Six, has a shipping weight of approximately 2700 lb.

Aside from its price, its fuel economy is expected to prove one of the important selling features of the new car, factory-test reports showing mileages per gallon ranging from a maximum of 26 down to 16, the latter figure corresponding to the car's top speed, which is given as 70 m.p.h.

The Graham line for 1935 also includes a Special Six, an Eight, and a Supercharged Eight, all of which are continuations of corresponding 1934 models, with detail mechanical refinements and markedly improved body styling. All of the new models have the same basic lines, although the Standard Six jobs differ in some respects from the other series. Interior dimensions of the bodies in the three larger series are the same as last year. Bodies on the new low-priced Six have somewhat less interior length and

in Low-Priced Market

By Don Blanchard

Editor, Automotive Industries

width, but head, leg and elbow room has not been sacrificed.

The accompanying illustrations show how appearance has been improved, better than words can tell, so it suffices to note here the narrower radiator grilles and the more sloping rear panels on the sedans—perhaps the two most striking changes. In all but the Standard Six, the spare tire and wheel occupy part of the large compartment contained in the tail of the body. Access to this compartment is through a door in the rear panel. On the Standard Six, the spare is carried externally at the rear, access to the luggage compartment in the tail being from the interior of the body by lifting the rear-seat back cushion.

The new Standard Six chassis is conventional in design, and since many of its salient features are presented concisely in the accompanying specifications box, it is unnecessary to go into all of its details here. The x-type frame used on this job differs from the design used on other Graham chassis in that it has a conventional kick-up over the rear axle, instead of the banjo construction. Additional stiffness is secured by carrying the front legs of the X forward, nesting them in the side rails, and then bending them inward to form a K with the front cross member.

Despite the difference in the frame, Graham practice of mounting the springs outside of the side rails is followed. The front springs have a rate of 152 lb. per in., while at the rear the rate is 120 lb. Measured on eccentric rolls, the front period is 100 and the rear 90, according to factory tests. Weight distribution is about 40-60.

The unit powerplant is three-point suspended in soft rubber. Two of the

supports are at the front and are installed at an angle to the horizontal. The third support is at the rear of the transmission. Cylinders are water-jacketed over their entire length, and there is water between all barrels as well as around all valves. The oil gallery is located between the tappets and cylinder barrels, thus facilitating lubrication of the former. In addition, since the top of this gallery forms the lower wall of the cylinder jackets, some degree of oil cooling is obtained.

The performance of the Supercharged Eight has been improved materially, particularly its performance at low speeds, by the adoption of a new four-arm, cast-aluminum manifold which connects each intake port directly with the blower outlet. While this change gives 7 lb.-ft. more torque and 10 more horsepower, the new manifold was not developed primarily to increase maximum output, since last year's cars had plenty of top speed.

The real object was to raise the torque curve at low speeds when the supercharger is not so effective either as a blower or as a mixer. The new design gives more uniform low-speed distribution and in addition reduces maximum mixture temperatures, both of which obviously contribute to the improvement in performance.

In "carbureting" the new manifold, it was found that with the larger carburetor needed, the single downdraft type would not give satisfactory metering at low speeds, presumably due to the larger jets and air passages. This problem was solved with a dual downdraft Stromberg, the smaller jets,

etc., giving the desired low-speed metering characteristics. The two outlets of the carburetor discharge directly into the blower, as did last year's single unit. The result of these changes has been to make the car decidedly livelier at low engine speeds.

Other new features on the Supercharged Eight are an electrical automatic choke and cast-iron brake drums. The Eight without the blower and the Special Six both are fitted with thermostatic chokes, and both have downdraft Stromberg carburetors instead of the updraft designs used last year. On the Eight, the carburetor is a 1-in. dual and on the Special Six a 1¼-in. single.

Frames on the Special Six and the two Eights have been stiffened by welding a plate to each side rail, to form a box section forward of the X-member. All three of these chassis have accelerator-type starters, and new instrument panels of attractive design, with the various meters grouped in a unit in front of the driver. On the right side of the panel there is a glove compartment, and in the center an ash receiver. In the four-door sedans, chromium-plated tubing is used in the construction of the front-seat frame. Automatic water pump seals of Schwitzer-Cummings make are another feature of these jobs.

All 1935 Graham models are equipped with Spicer direct-acting shock absorbers.



Graham Eight and
Supercharged Eight
Sedan

Pontiac Adds a Six at \$615 t

Offered in standard and deluxe series, former with conventional front springs; eight continued with refinements; all models have turret tops and hydraulic brakes

A NEW Six, priced at from \$615 to \$795, has been added by Pontiac to its eight-cylinder line for 1935. It is offered in standard and deluxe series, the former with semi-elliptic springing and the latter with independent front suspension. New bodies developed for the Six also will be mounted on the eight-cylinder chassis.

Features of the new bodies include the Fisher "turret top" or one-piece stamped steel roof panel, Vee windshields with greater slope than formerly, greater curvature of side panels to increase seat width, and considerable slope for the rear body panel in the sedans, with the spare tire and wheel carried concealed in a horizontal position in a compartment in the back of the car.

At the front end there is a shallower and wider gap between fenders and hood, with headlamps mounted on front fenders by means of streamlined brackets. Fenders are also new and of the wheel-cowl type introduced on some makes last year. On top of them are Pontiac's characteristic indicator lamps. The radiator shell, which is located well forward, is rounded off, while the central ribs of the grille are carried back over the hood. Bodies are somewhat lower than last year, as a

result of the adoption of 16-in. wheels with 6.00-in. tires on the Six and 6.50-in. on the Eight. Wire wheels are furnished on the Six and steel-spoke wheels on the Eight.

Except for the engines, the new 112-in. wheelbase Six and the Eight (which now has a 116 $\frac{1}{2}$ -in. wheelbase) are quite similar in general design. As a matter of fact, the six-cylinder engine follows closely the design of the eight-cylinder. On both cars the powerplants are located well forward, that of the Eight having been moved 5 in. forward as compared with last year's model. As a result, the weight of the four-door sedan is practically equally divided be-

tween front and rear wheels. It may be mentioned here that the weights of these cars are 3400 and 3550 lb. for the Six and Eight respectively.

Engine mountings on both cars are of the five-point type, powerplants being cradled on rubber both at the front end and at the rear of the transmission. In addition there is a stabilizing block of rubber below the engine at the rear. This method of mounting appears to give the powerplant considerable freedom of response to torque impulses.

Combustion chambers are of a new design—a further development of the G.M.R. head. There is a low clearance over the exhaust valve and increased room around the intake valve for better breathing action and increased volumetric efficiency. No increase in horsepower is claimed for the Eight, but the Six, with a piston displacement of 208 cu. in., is said to develop 80 hp. at 3600 r.p.m. Judging from these figures, the weights of the cars and axle ratios, which latter are 4.44 on the Six and 4.55 on the Eight, the Six should not be far behind the Eight in respect to acceleration at low speeds, while its high-speed performance should be better than that of the Eight, if anything.

It will be noted that the six-cylinder engine, the same as the eight, has a short stroke, its cylinder dimension being 3 $\frac{1}{2}$ by 3 $\frac{1}{2}$ in. This permits the use of a crankshaft with overlapping journals for maximum rigidity. The shaft is counterweighted and supported in four steel-backed, babbitted main



Three-quarter rear view of the two-door sedan

to \$795

Some appearance features
that mark the new Pontiacs

bearings. Engine blocks extend $2\frac{1}{2}$ in. below the crankshaft axis and are well ribbed both inside and outside of the crankcase. Cadmium-silver-copper alloy replaceable bearings are used in the connecting-rod big ends of both engines. The new alloy has a much higher melting point than babbitt and maintains its strength better at high temperatures, hence assures a greater safety factor for high-speed operation. Other engine features include pistons and rods machined to exact weight and center of gravity, a water distributor tube for cooling exhaust-valve seats, metering holes in the crankshaft to maintain the oil pressure even with worn bearings, tapered valve guides, valve-spring dampers, and a Carter triple-venturi carburetor with a manual choke and thermostatic heat control. The latter is fitted with a tube extending from the heater valve to a point behind the fan, where the temperature is more nearly that of the outside air. The seasonal adjustment is located at the fan end of this tube. Intake risers are now made of tubing, to reduce their heat capacity, and this change has resulted in a more rapid increase in intake-mixture temperature when starting from cold. There is also a vacuum control for the spark advance.

Generators are fan-cooled, and charging control is of the voltage-limit type, the relay being mounted on the dash.

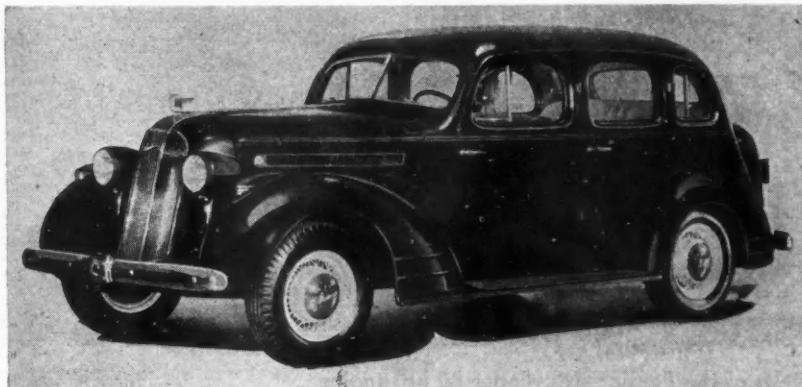
With the new control the third brush is fixed in position. Pure copper is used for distributor points. Direct shift starter engagement is combined with an accelerator-pedal switch in the new cars. The motor is of the four-pole type and has 25 per cent more starting torque.

Both cars are fitted with a clutch of

new design, having the driven plate divided into six sectors, with adjacent sectors bent in opposite directions. A cushion-spring center is provided. The pressure plate is of electric-furnace iron containing nickel and chromium. Release fulcrums are of the knife-edge type, and the assembly is adjustable for height, to square the release bearing plate with the transmission shaft. With this new clutch the pedal travel has been reduced 1 in. Transmissions of the Six and Eight are similar and do not differ materially from 1934 units, being of the synchro-mesh type, with helical gears for constant mesh and second speed.

Rear axles are virtually unchanged on the Eight and those of the Six are similar in design, but have the lower gear ratio already given.

An important feature of both lines



1935 Pontiac De Luxe Six 4-door
Touring Sedan



By tilting the backs of the seats forward, compartments for luggage and spare tire are made accessible

is the use of Bendix brakes, now hydraulically operated. Drums are 12 in. in diameter and the lining is 1 3/4 in. wide. Flanges on the brake drum and the backing plate provide a double seal against dirt and moisture in front, and a triple seal at the rear. The drums themselves are of high-manganese steel, which is said to have excellent anti-scoring qualities. Operation of the hand-brake is by means of cables to

the rear wheels, actuating the service brakeshoes through a cam.

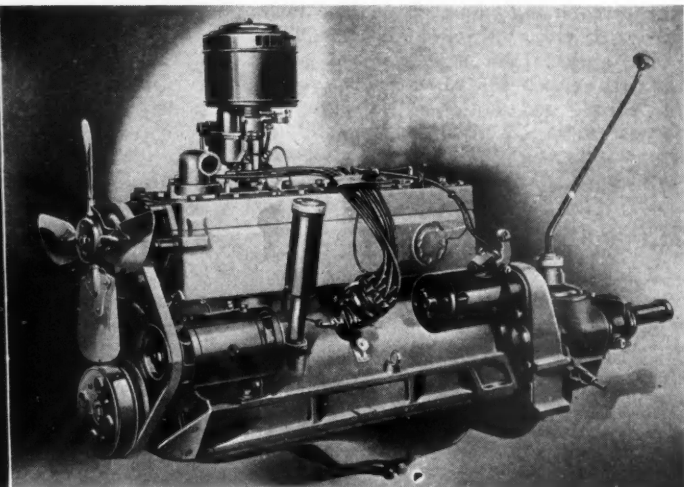
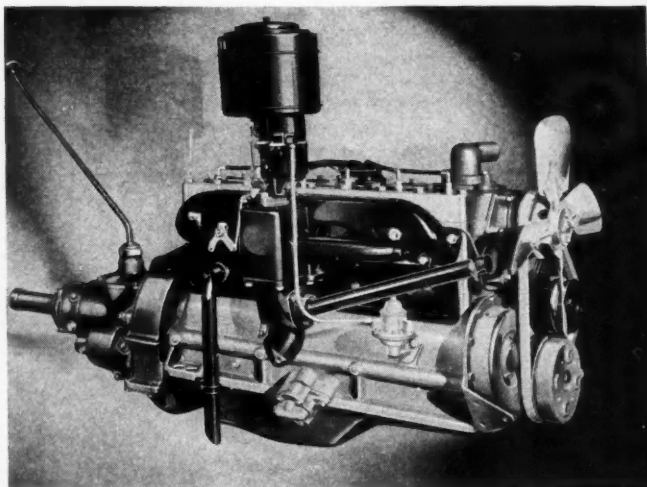
Frames on the Six are of the same design as those on the Eight, the main difference being in length. A number of improvements have been made, including the substitution of a tubular cross-member for the channel-type which formerly served as support for the steering heads. This change was made to increase the torsional strength

and rigidity. Frame side rails have been made deeper and wider at the points where this support member is secured to them. The rear legs of the X subframe have been extended within the side rails to the rear horns, to form a box section over the kick-up, for increased rigidity. With the same end in view, the frame is braced considerably more than last year.

The steering ratio has been increased to 17.5 on the Eight, owing to the larger tire contact areas of the 1935 models, and the same gear is used on the six-cylinder cars. Leaves of rear springs are now taper-rolled, for better stress distribution and reduced friction, and spring covers are provided. Jack lift brackets have been provided at the front on side-rail horns and at the rear on extensions of the rear spring rear shackle. Changes in the front suspension of the Eight are only minor in character, and are intended to increase its durability. Greater protection against oil leaks is afforded and the capacity of the wheel-support bearing has been increased. The same design of front suspension is used on the Deluxe Six.

The Standard Six has fairly soft semi-elliptic springs at the front, with an I-beam axle with reverse Elliott ends. Springs are 36 in. long, 1 3/4 in. wide, and shackled at the front, the shackle bolts being threaded. At the rear the spring is rubber-bushed. On this model there is an anti-roll stabilizer at the front as well as at the rear. Other models have the rear stabilizer only. Shock absorbers on the Standard Six are single-acting, those on other models double-acting.

As compared with 1934 bodies, the front seats are 2 in. wider and rear seats 1 in. The front seat is 3 1/2 in. wider than the rear. The former is recessed in the back to form foot rests for the rear compartment. A 1-in. gain in head room at both front and rear

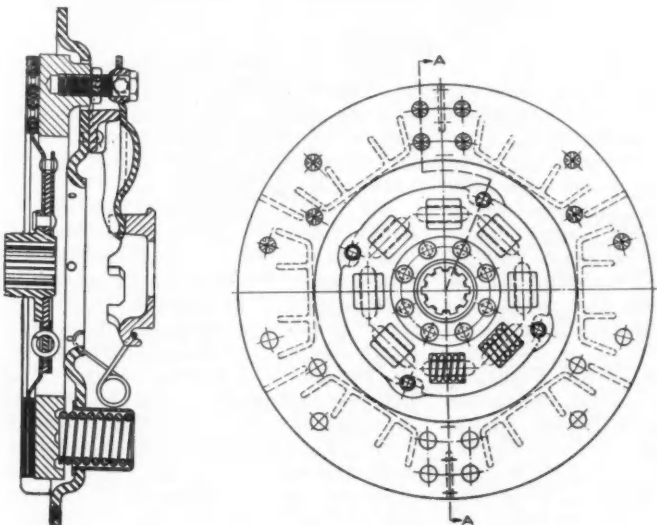


Right and left side views of the Pontiac six-cylinder 80 hp. engine

Specifications of the New Pontiac Six

Number of cylinders, six.
 Bore and stroke, $3\frac{3}{8}$ by $3\frac{3}{8}$ in.
 Piston displacement, 208 cu. in.
 Output, 80 hp. at 3600 r.p.m.
 Compression ratio, 6.2 standard.
 Piston material, cast iron.
 Cylinder head material, chrome-nickel iron.
 Conn.-rod length, $7\frac{11}{16}$ in.
 Bearings, cadmium-silver-copper alloy with steel back.
 Crankpin bearing, 2 by $1\frac{7}{16}$ in.
 Main bearing sizes (front to rear)—
 2 by $1\frac{1}{8}$ in., 1 $31/32$ by $15/16$ in., 1 $15/16$ by $15/16$ in.,
 1 $24/32$ by $15/16$ in.
 Camshaft drive by Morse chain, 56 links, $\frac{5}{8}$ -in. nominal width,
 $\frac{3}{8}$ -in. pitch.
 Intake valves, silicon-chromium steel, 30-deg. seat, 1 $17/32$ -in.
 overall diameter, $19/64$ -in. lift.
 Exhaust valves, silicon-chromium steel, 45-deg. seat, 1 $15/32$ -in.
 overall diameter, $19/64$ -in. lift.
 Radiator core, cross-flow cellular.
 Ignition, Delco-Remy.
 Starter and generator, Delco-Remy.

Battery, Delco 94 amp.-hr.
 Clutch, single-plate dry, $9\frac{7}{8}$ -in. diameter.
 Transmission, three-speed and reverse, helical gears, synchro-
 mesh.
 Drive taken through springs, torque through tube.
 Final drive, spiral bevel gears.
 Rear-axle ratio, 4.44 standard.
 Tire size, 16x6.00, inflation pressure, 25-30 lbs.
 Wheels, wire spoked.
 Front springs, coil springs of silico-manganese steel on Deluxe
 six half-elliptic springs on Standard six.
 Rear springs, chrome manganese steel, 54 by $1\frac{3}{4}$ in. *
 Steering gear, Saginaw worm and roller.
 Front axle on Standard, tubular, Elliott type.
 Brakes, Bendix hydraulic four-wheel.
 Brake drums, high-manganese steel.
 Brake size, 12-in. diameter, $1\frac{3}{4}$ -in. width.
 Total service-brake area, 162 sq. in.
 Wheelbase, 112 in.
 Front tread, $57\frac{3}{8}$ in.
 Rear tread, $57\frac{21}{32}$ in.
 Shipping weight of standard 5-pass. sedan, 3290 lb.



Section through the clutch assembly in
Pontiac 1935 models

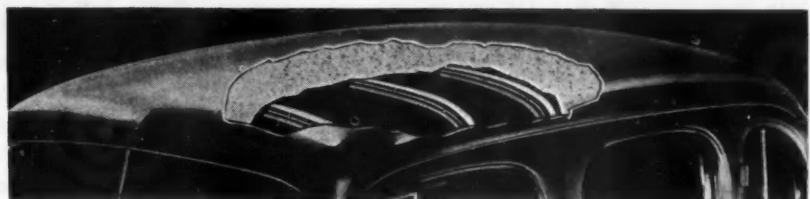
seats resulted mainly from the reduction in the thickness of the roof structure due to the adoption of the steel roof with steel bows. On the two-door model the front seats are of the full sedan type, except that the back is hinged and is split into two sections, left and right, for access to the rear compartment. Moving the rear seats farther forward, aside from improving the riding qualities, has permitted the provision of a package shelf 7 in. deep back of the rear seats in Sedan models. The increased width of the body at the front has resulted in more space between the steering wheel and the doors. On the Eight and Deluxe Six, arm rests are provided in front as well as in the rear compartment. Rear arm rests have built-in ash trays. The two

tie rods between the dash and the radiator-and-fender assembly now cross at the center.

On the Standard Six, headlamps, tail-lamps, fenders and radiator splash

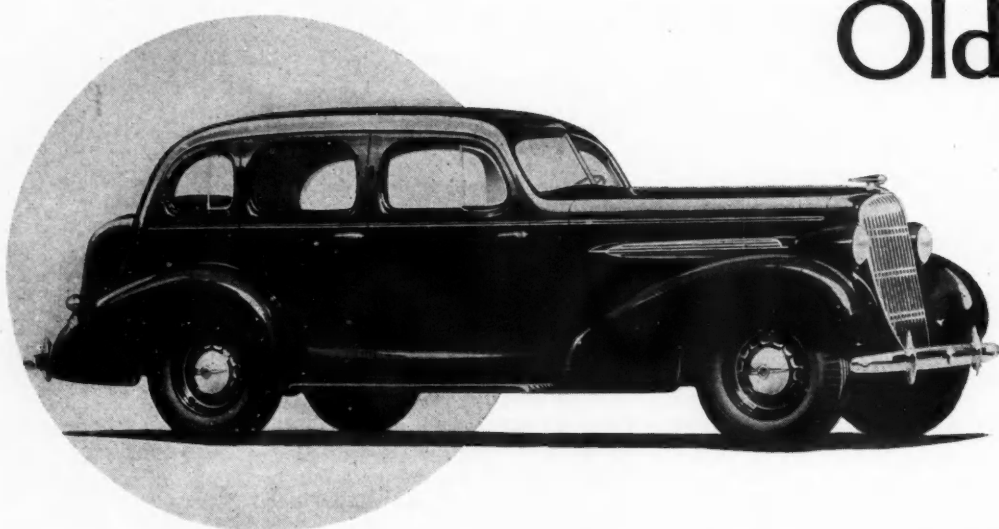
apron are finished in black and fenders do not carry indicator lights. On this model a light indicator in the speedometer face shows whether the beam is in the raised or lowered position. On all models, however, tail lamps are carried in the rear compartment door, while gas fillers are located in the right-hand fender. Other items of equipment on the Deluxe Six but not on the Standard Six include assist cords, ash receivers, front arm rests, rear-quarter window ventilators and rear curtains.

All three chassis lines are available in two-door and four-door sedans, two-door and four-door touring sedans with built-in trunks, and business coupe. The Deluxe Six and Eight are also available in sport coupe and carriolet roadster models.



Cut-away of the turret-top on the new Pontiac showing its
construction

Olds Refines S



Oldsmobile Eight Touring Sedan with integral trunk

NEW styling, steel tops, improved performance, and increased economy of operation characterize the 1935 six- and eight-cylinder models offered by Olds Motor Works. Features of the new bodies include one-piece all-steel roofs, vee-type windshields, rear luggage compartments and concealed rear mountings of spare tire and wheel in a horizontal position, running boards separated from front and rear fenders, windshield wipers operated from the base of the windshield, more sloping rear panels with bodies moved forward relative to wheels, all-steel floor and toe boards, forward-opening doors for front compartment, new hood louvers, grilles and radiator ornaments, and headlights mounted from radiator shell on streamlined brackets.

Major changes in both chassis include strengthened frames, wheel suspension and steering linkage, larger rear axle bearings, larger diameter propeller shaft, increased brake capacity with high-manganese drums and wider shoes, easier service adjustment for rear axles, and rubber valve stems in inner tubes. On the Six, which weighs about 150 lb. more than last year, larger tires are now fitted and the capacity of the fuel tank has been increased.

Taking the engines in detail, power and torque were increased mainly by increasing the compression ratios, which was made possible by a further development of the G.M.R. cylinder head shown in the accompanying illustrations. It will be noted that this head embodies a dome over the far end of the chamber, designed to improve the breathing action. The clearance space over the piston also has been reduced in depth. The compression ratio is now 6.0 in the six-cylinder model and 6.2 in the Eight. To reduce the vol-

ume of the compression chambers as much as required for these high compression ratios, the pistons are made to come nearly flush with the top of the block at the top end of the stroke.

Cylinder bores of the Six are now finished by a double honing operation, the same as those of the Eight. On the Eight, drilled oil distributor leads replace the former piping, making it uniform with the Six, and a water distributor tube replaces the former water manifold plate, to reduce the likelihood of leakage at this point.

The crankshaft of the six-cylinder engine has been entirely redesigned and is now 85 per cent counterweighted. Heavy counterweights were added adjacent to the central main bearing, and the diameter of crankpins was increased to 2 in., with the result that the total weight of the crankshaft was increased 14 lb.

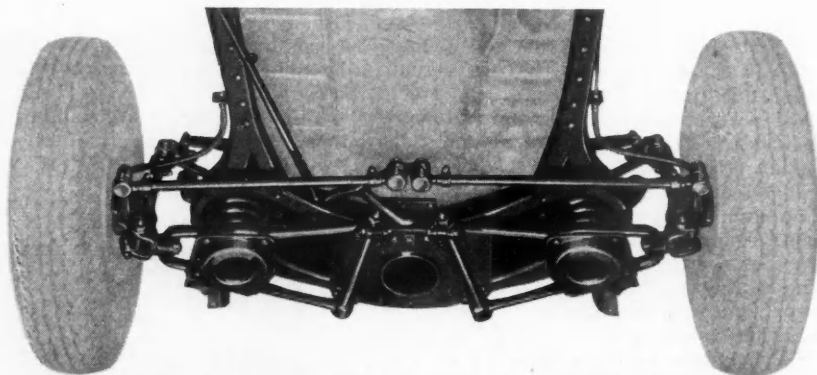
On the crankshaft of the Eight the end thrust is now taken on bronze washers instead of on flanges at the central main bearing. On the Six the thrust is taken on the front main bearing, instead of on bearing No. 2, the same arrangement of bronze collars as

on the eight being used. The net effect in both cases is to virtually double the thrust surface.

Connecting rods in both models have been strengthened near the bolt bosses. On the Eight, compression rings now have a small step cut in the lower outside corners for better oil control. Oil-pump capacity has been increased some 50 per cent by simple changes in gear-tooth shape, to insure maintenance of oil pressure even after considerable bearing wear. At the same time the pressure relief valve has been increased in capacity to prevent excessive pressure with cold oil.

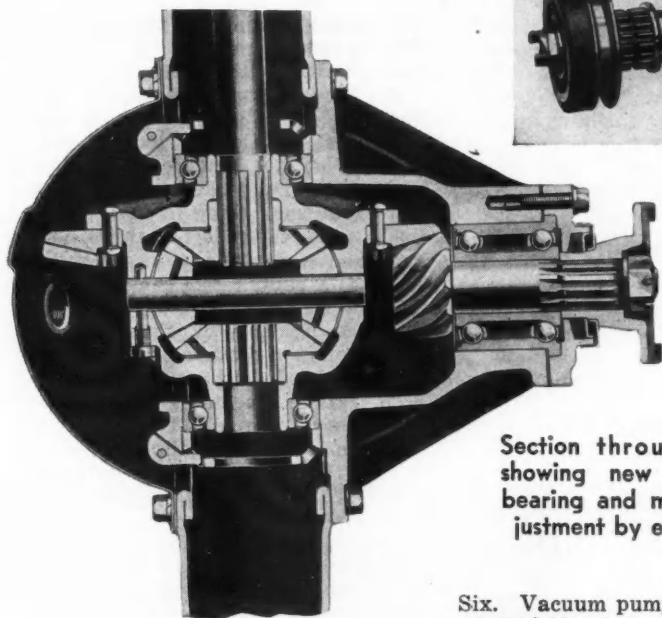
To facilitate heat flow from the exhaust valve and keep down its temperature and that of its seat, the valve heads were redesigned. Valve springs now have the upper three coils closed, which eliminates the need for the anti-surge cages previously provided. On the six-cylinder engine the valve timing was advanced 5 deg. all around, the inlet now opening 5 deg. ahead of T.C., which has resulted in a slight increase in power.

In the cooling system of the Eight, the spring-loaded by-pass valve used



Detail improvements have been made in the Olds front suspension. Note the angled drag link running directly to the intermediate steering arm. Also the new method of attachment lower wishbone links to frame cross-member

Sixes and Eights for 1935



Section through rear axle showing new pinion shaft bearing and method of adjustment by external shims

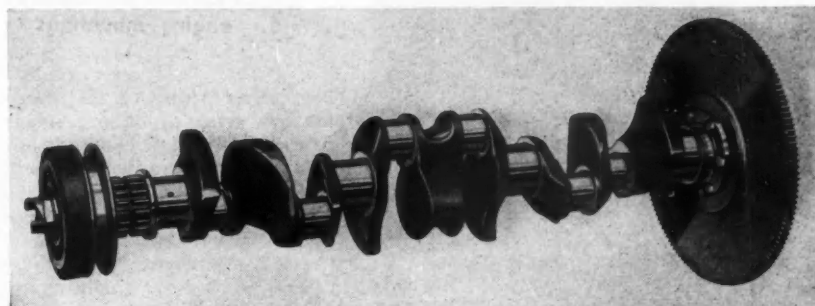


Photo of new Olds six crankshaft with larger crankpins, heavy central counterweighting to reduce center main bearing loads, etc.

last year in connection with the cylinder-head thermostat has been supplanted by a simple tube connection. Detail improvements in the water pump have been made to reduce thrust loads. Two hose connections have been eliminated by substituting an elbow tube of molded rubber for the steel elbow between the pump inlet and the lower radiator connection, which change also reduces strain on the lower radiator tank.

In the eight cylinder the manifolds now slope down from the central riser, to facilitate fuel flow for easier starting in cold weather, particularly when the car is on a grade. Drains are provided below the risers, which function as "atomizers" for the raw fuel, drawing a stream of air in from outside the manifold under cranking conditions. At higher engine speeds the opening is closed by a ball check valve. Carburetors on the Eight are now vented into the air stream above the choke valve, instead of to atmosphere, as a protection against dirt. The eight-cylinder model now carries the same fast-idle device as the Six. Chokes have been improved in operation and are controlled jointly by the temperature, the manifold vacuum, and the air velocity in the carburetor inlet. This item is standard on the Eight and extra on the

Six. Vacuum pumps for operating the windshield wipers in connection with the fuel pumps are available on both models.

Generators are now cooled by forced draft and are provided with voltage control. There is also a thermostatic control to prevent charging at excessive rates when the engine is cold. Third-brush charging-rate control is also retained.

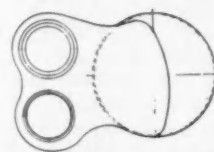
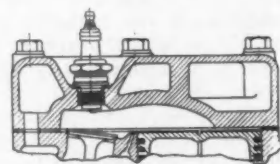
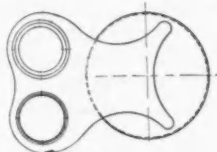
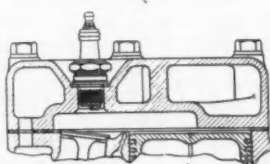
In the starter mechanism the solenoid switch has been dropped, and Oldsmobile has returned to the direct mechanical shift. Ignition coils have been moved to the forward side of the dash, to shorten the high-tension lead,

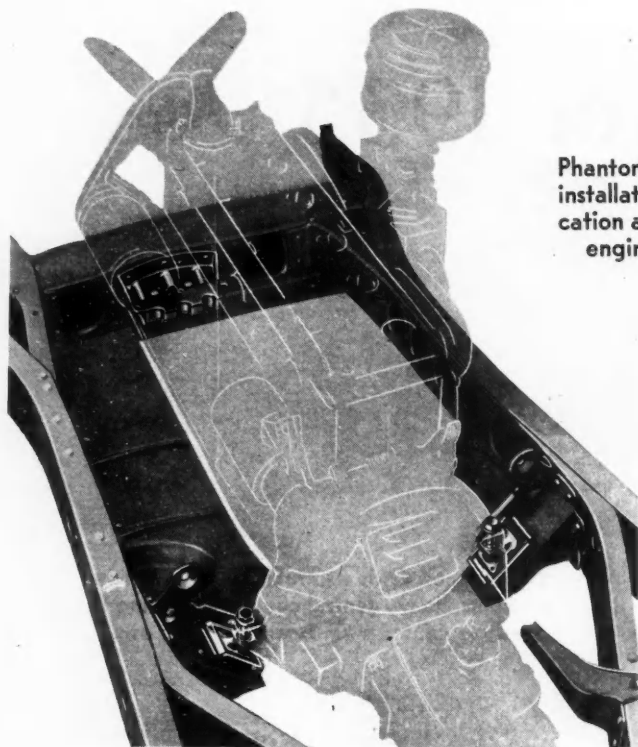
thereby improving the ignition as well as assisting in radio shielding. The six-cylinder distributor is now driven through the same type of jointed shaft as that on the Eight. Ignition timing is facilitated by a hole in the forward side of the flywheel housing through which the timing marks are visible.

Clutch release plates now have the cast iron collar backed by a hardened steel plate, to prevent the clutch release levers from wearing depressions in the collar. Driven disks have been reshaped for better cushioning, and softer engagement has been obtained through the use of different linings on the front and rear facings. Ventilation has been increased on the six-cylinder model, and the pressure plate made heavier to enlarge its heat capacity.

Powerplants have three-point mountings, there being one point of support centrally in front and one on each side of the flywheel housing, somewhat farther forward than on the previous models. This is intended to eliminate side shake at high speed and to increase the resistance to torsional vibra-

Line drawing sections showing changes in combustion chamber shapes of 1935 models compared with 1934 types. The 1935 chamber is shown at the left





Phantom view of engine installation showing location and new types of engine mountings

tion under clutch engagement through the wider spread of the rear mountings. There is considerably more rubber in the mountings than last year, the object in view being to reduce high-frequency vibration and noise transmission.

Mufflers on both cars have been increased in length and capacity, and tail pipes have been extended beyond the rear of the body.

In view of their increased length, propeller shafts have been increased in diameter to 2½ in., to provide against whip.

A two-row ball bearing has been adopted for the pinion mounting of the rear axle. The spacing between the rows of balls is wider than previously, which reduces the bearing load, and incorporation of an integral flange at the forward end of the outer race facilitates adjustment of bearing position by shimming from the outside. The rear axle ratio is 4.44 on both cars, and the ring gears and pinions are now interchangeable between the two models. Axle shaft bearings have 20 per cent more load capacity.

Frames have been strengthened at the rear end, an additional channel member being welded into the side rails there, which is said to increase the torsional stiffness of the frame as a whole about 35 per cent. The front cross-member has been simplified in design and the separate suspension mounting plate eliminated. The lower arms of the independent suspension are now pivoted directly on the cross-member.

The suspension itself remains fundamentally the same as last year. The

steering hook-up has been simplified by the provision of an intermediate steering arm of new design, directly connected to the pitman arm. The steering ratio on the Six has been increased to 17.5, and the worms of both gears are now of nickel-molybdenum steel.

Brake capacity on both models has been increased by widening the shoes to 2 in. On the Six the nominal diameter was increased 1/16 in., to allow the use of a thicker lining. High-manganese steel drums replace the low-carbon steel drums formerly used as added insurance against scoring. Brake cylinders of the hydraulic actuating mechanism are now mounted on the backing plates. While front and rear brake cylinders are of the same size, linings with different coefficients of friction result in a division of braking effort in the approximate proportion of 55 per cent front and 45 per cent rear.

The lighting system used on the Eight last year is now standard on both models. Speedometer faces are provided with a red indicator light to indicate when the light beams are in the raised position. Double tail and stop lamps of new design are standard on the Eight, single lights on the Six. A thermostatic circuit breaker replaces fuses in the wiring of the Six.

Adoption of the steel roof obviously increases the strength and rigidity of the body as a whole. These roofs are "deadened" by cementing sheets of celotex to them, to the lower side of which are attached a large number of wood blocks slightly separated from one another. Cowl structures have been

strengthened by making instrument panels integral with the rear side of the windshield pillars. Wipers are now located at the base of the windshield, which eliminates wind noise and has other advantages. The greater slope of the windshield and increased curvature of the front roof header tend in the same direction. A non-drying cement is now used in the fixed windshield assembly.

With the resultant change in air-stream characteristics, cowl ventilators once more open toward the front.

Large compartments are provided at the rear of all five-passenger models, in the lower section of which spare tires and wheels are carried, secured by two clamps. Provision is made to inflate the tire without removing it.

On the coupes, spare tires are carried inside the body, just back of the cross seat, under the ledge provided there. They are rendered accessible by tilting the right-hand seat-back forward (the back being in two sections). In the space to the left of the tire there are shelves for the storage of tools. There is a similar tool compartment in the five-passenger models, at the rear.

Direct lighting of the instrument panel is now a feature on both models, control being by a three-position switch. Both seats are located approximately 5 in. farther forward. The weight distribution was materially changed by moving the powerplant and passengers forward, being now 47 per cent front and 53 per cent rear.

Bodies are 3 in. wider at the front seat than last year. Front doors are now hinged to the center body pillars, which makes for smoother door lines. Toggle-type door locks replace the button type.

Returning to the outside, headlamps are now mounted on streamlined brackets from the radiator shell. To clear these brackets when raising and lowering the hood, the hood side panels are cut back at the forward edges. The front-end harness for carrying lamps, radiator core and fenders has been strengthened. Wheels are of a new design, 16 in. in diameter. They have 4.50-in. rims on both models to permit interchangeable tire mountings. The Six now carries 6.25 in. tires, with lower inflation pressures than previously, and over-size tires on this model have been discontinued. There has been no change in the tire equipment on the Eight.

Napier Take Junkers License

A LICENSE for the manufacture of Junkers Diesel aircraft engines in Great Britain has been secured by D. Napier & Son, well-known manufacturers of aircraft engines. The Junkers engines operate on the two-stroke principle and have two opposed pistons in each cylinder, the cylinders normally being arranged vertically with crankshafts at top and bottom which are connected by a train of gearing.

Five Main Sections Form the New Fisher "Turret Top" Bodies

WITH the introduction of the "Turret Top" body on a number of General Motors 1935 cars, the Fisher Body Division of the corporation begins the manufacture of bodies produced without a separate back panel stamping.

In this construction, the body proper consists of five stampings welded together to form a unit shell reinforced by a girder-type interior framing which is welded to the shell at various points. The steel roof is a single stamping extending from the windshield header, around the back and down below the level of the rear window where it is flanged to form the top of the enclosed luggage compartment opening. The entire front end from the instrument panel forward and including the

corner posts is a single unit. Side panels curve around to form the side walls from the hood line to the luggage compartment in the rear. A steel underbody completes the ensemble.

A battery of 18 new presses of large capacity was required to handle the forming of the uncommonly large stampings resulting from this construction. The steel roof alone goes through four of these presses—two toggle presses each weighing about 500 tons and exerting 1950 tons pressure; and two tandem slide presses weighing about 400 tons each and exerting 650 tons pressure. The draw die weighs 36 tons, trim die 52 tons; the cam die for forming the roof rails, windshield and window trim molding weighs 64 tons; the offset die weighs 44 tons.

For thermal as well as acoustic insulation the body side walls and the underside of the roof are covered with a cemented layer of $\frac{1}{4}$ in. checked and corrugated felt lining roughened to increase absorption. This type of material was selected after a series of tests of eight different insulating linings. The dash is covered with a felt and fibre board lining which serves as a sound deadener as well as heat insulator. The steel underbody is covered with a layer of heavy jute.

To further insulate the body interior from heat and cold, particularly from the effect of direct sunshine, there is a dead air space at the ceiling between the cemented felt insulating lining and the headlining. Tests made by Fisher body engineers are said to show that the new bodies heat up only half as much as conventional types at the roof level and only one-third as much at the passengers' head level.



Front end assembly of the new Fisher "turret top" Body, constructed entirely of steel, and welded to the single sheet of seamless drawn steel that forms the roof

The set-up buck in which the five main sections of the new Fisher "turret top" body are electrically welded into a solid steel unit





Photo by courtesy
of The Lincoln
Electric Co.

PRODUCTION LINES

Fuel Specifications

Continuing where we left off concerning Diesel specification fuels, we have gathered some choice bits of information. We know now that at least two major oil companies have taken the automotive Diesel most seriously and are developing specification fuels that will be offered to the industry. It's smart and profitable to be ahead of the parade and these people expect to cash in on their advanced position.

Lab Control

Are you getting regularly the little technical bulletins issued by Union Drawn Steel? They all deal with Vigilant Laboratory Control and the unique advantages of controlled cold drawn steels. For instance the current copy has an important message to metallurgists and factory men on the advantages of cold drawn steel. If you can put some of these ideas to work, let us get you on the mailing list. No obligation on your part.

Built-Up

One of the most magnificent demonstrations of scientific research is found in the paper on metal cutting presented by Hans Ernst of Cincinnati Milling Machine Co. at the 1934 annual meeting of the ASME. It presented pictorially what happens when metal is cut and demonstrates that the so-called built-up edge at the cutting tool point is to be found under all conditions, to a degree. Incidentally, the built-up edge clearly is the cause of rough sur-

face finish, since the plastic area constantly breaks off and flows either with the chip or remains on the surface of the work.

Fine Idle

Out our way we saw a new high-speed automotive diesel, not ready for public announcement but very, very interesting. It isn't particularly heavy; it is smooth with barely a trace of knock, and will operate at about 1800 r.p.m. Perhaps its most noteworthy feature is smooth low-speed idling—under 200 r.p.m., without a whimper. It is claimed that this job will perform well on any commercial fuel, regardless of detail specifications. This engine seems to hold great promise.

Wine to Fuel

Chamber of Deputies of France, so the report goes, is working on a plan to buy about 4,000,000 gallons of surplus wine to be converted into alcohol at a cost of about 2½ cents per litre. This alcohol is to be used for mixing with motor fuel. Surplus wine for French cars.

Steel Roofs

It has been pointed out by radio experts that the steel roof for auto-bodies complicates radio installation to an extent. The biggest change is the relocation of the antenna, which can no longer be mounted in the ceiling. The most obvious location, of course, is under the floor where wood under-

bodies are used or underslung in the case of steel underbodies. Either construction seems to require considerably more power in the receiver. Just the other day we were told of the possibility of arranging a compact antenna mounting in the sun visors, provided these were made of an insulating material such as Bakelite or similar molded product. Here is an interesting angle for exploration.

On the Job

The U. S. S. R. certainly is on the job in following technical developments in this country. At the recent ASME annual meeting several representatives of the Amtorg organization covered all the sessions in search of the new. Much of the transactions will be published in the U. S. S. R. technical journal.

Cemented Carbides

We asked some time ago whether cemented carbides could or would be used on broaches for surface broaching applications. The answer is yes. Right now several big automotive applications are being tooled with c-t-c tips on the finishing sections.

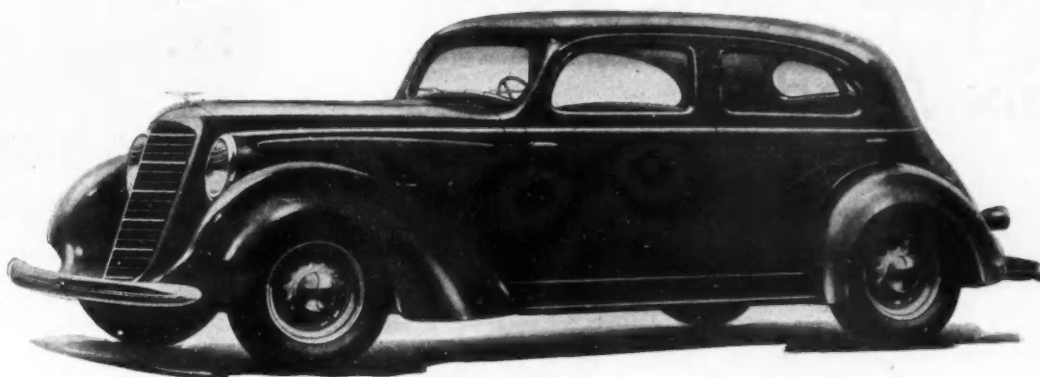
Fay Job

A very complete report on the fabrication of transmission gears and shafts is contained in a bulletin recently issued by Jones & Lamson. It concerns some rather interesting set-ups on a Fay automatic. Complete details are given of the tooling, materials, and production time. This bulletin may be of more than passing interest to you.—J. G.

MANUFACTURING
MANAGEMENT
METALLURGY

New Hupp Six Puts Aerodynamic Styling in Lower Price Field

Hupmobile Series 518 Sedan on the new lower priced aerodynamic line. In general body lines are similar to the larger aerodynamic



A NEW Aerodynamic six on a 118-in. wheelbase has been added to the lines of the Hupp Motor Car Corporation and is intended to sell at prices lower than those on the Series 417, Hupp's lowest-priced 1934 line. The new car appears to be a development as regards both chassis units and body designs, of the larger 1934 car, the Model J, which is equipped with a six-cylinder $3\frac{1}{2}$ by 4 $\frac{1}{4}$ -in. engine and has a 121-in. wheelbase.

Bodies of the new line are of substantially the same design as those of the current larger Aerodynamic line. The new car has a longer hood than the J series, which is due to the fact that the engine is located farther forward, and this change, together with the narrower Vee-shaped sloping radiator grille, adds materially to the appearance of the new models. Other differences include a sealed rear luggage compartment, which is rendered accessible by tilting the back of the

rear seat; a one-piece, fixed windshield, improving visibility; a slightly reduced body width across the front seat, and slightly modified fenders. In other respects the cars follow closely the lines of the larger models.

Head-room in the rear compartment has been increased by lowering the seat, which was made possible by moving both seats farther ahead. Leg-room also has been increased, this having been achieved mainly by making foot-rests integral with and recessed in the backs of the front seats. Front seats, while slightly narrower than on the larger models, will still accommodate three people. The forward location of the front seat, in close proximity to the windshield, further improves the visibility. Instruments are located in the lower windshield header, where they are easily seen. There is a glove compartment on each side of the instrument panel.

As the rear doors of sedans are hinged to the center pillar and ex-

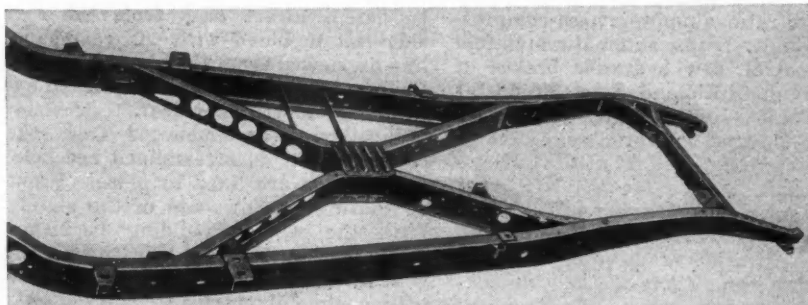
tend well back into the rear quarters of the body, the baggage compartment back of the rear seat is easily accessible from outside the car. As on the other cars, spare wheels are partially recessed into the rear panel and completely sealed in with the metal tire cover provided.

The new car carries the same 101 hp. six-cylinder $3\frac{1}{2}$ by 4 $\frac{1}{4}$ -in. engine that is used in the larger Model J series, with certain minor changes. To provide sufficient clearance with the forward location of the engine, the oil-pan has been cut back. With the power output of this engine and the fact that the Series 518 will weigh less than 3000 lb., and should have really outstanding performance characteristics.

Although conventional springing of the semi-elliptic type is used at the front of the car, the front spring rate is 165 lb. per in. and the frequency of the front end is 90 cycles per minute. This compares with a rate of 120 lb. per in. and a frequency of 70 cycles per minute for the rear springs. The front springs are quite long and the leaves are taper-rolled for better stress distribution.

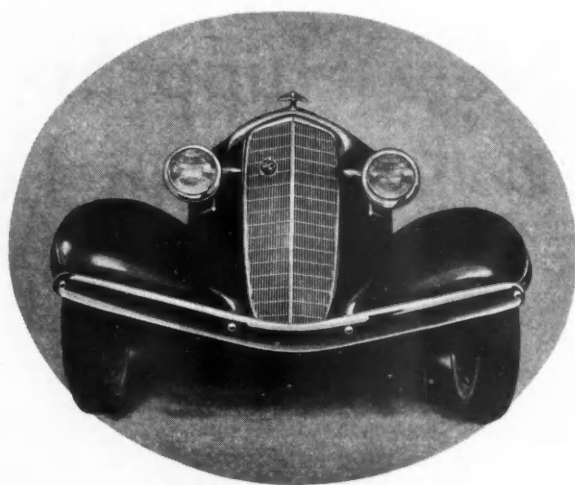
Steering gear installation is quite novel, the gear being located on the left front spring horn, with the drag link running back to a bell crank at the left front wheel, and extending back of the tubular front axle. This installation gives a strongly raked position of the steering column in spite of the forward location of the front seat. Both the steering arm and the drag link are outside of the frame.

Frames are of the double drop X-type, with a maximum side rail depth of 6 $\frac{1}{2}$ in., a 1 $\frac{1}{8}$ -in. flange, and 7/64-in. (Turn to page 32, please)

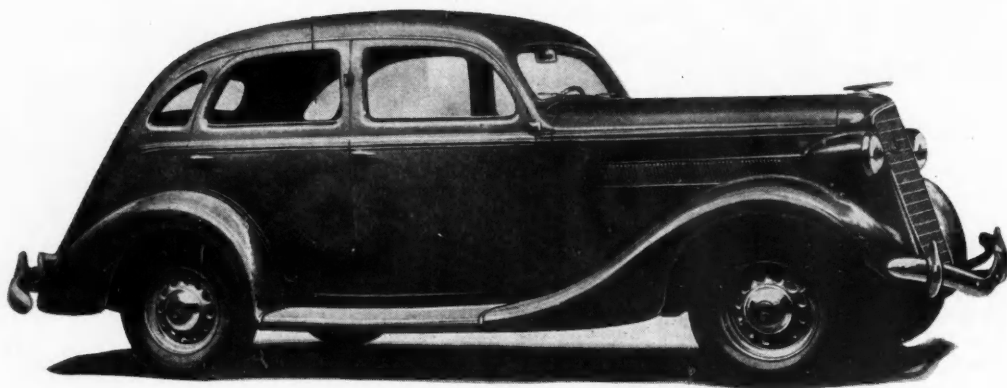


Hupmobile's new Series 518 has an X-frame notable for both torsional rigidity and lightness

Reo Adds Lower- Priced Flying Cloud Six Model



Front view of Reo's new Flying Cloud in the low medium priced field



Four door Sedan on the new lower priced Reo Flying Cloud line on a 115 in. wheelbase

OFFERINGS of the Reo Motor Car Co. in the passenger-car field for 1935 include a new six-cylinder Flying Cloud in the low-medium price range. Production of this car in quantity is expected to get under way only after the first of the year.

The new car is an addition to the Reo line. It has a 115-in. wheelbase and is fitted with new bodies which are located well forward on the chassis, owing to the forward mounting of the powerplant. This assures a liberal amount of body room in spite of the considerable slope of the tail panel. It is equipped with a short-stroke engine said to be newly developed for this car, of 3½ in. bore and 4 in. stroke.

While a conventional Reo transmission is standard equipment, an entirely new design of self-shifter transmission is optional at low extra cost on the new model. This new unit is semi-automatic in operation, the shift being interconnected with the accelerator pedal and manifold vacuum. Self-shifters on other Reo models, as previously, are automatic in shifting from the 'get-away' speed to the high speed.

As with the better known Reo self-shifter, this new unit has a dual range,

selectable at will. The normal driving range provides a get-away ratio of 1.8 to one. Downward shift into a lower speed is automatic when the car is slowed up sufficiently on a grade. The low-speed range however can be selected at will by moving the four-position control handle on the dash, which has four positions, as follows: Driving range, low-speed range (two speeds also), reverse and neutral.

Other mechanical details of the new car include an X-frame, rear axles similar to those of the larger former Flying Cloud model, with a 4.3-to-one standard ratio, aluminum high-compression cylinder heads, automatic manifold heat control, new hydraulic brakes of Steeldraulic (Midland Steel Products) make, new pressed steel wheels with 6.25/16-in. tires, starter engagement by depressing the clutch pedal to the floor, and a kick shackle for the left front semi-elliptic spring.

Spare tires are stored horizontally in the lower section of the rear compartment, the remainder of the compartment forming a trunk. Engines are recessed into a cowl pocket to provide additional front-compartment leg room. Radiator grilles are located well ahead

of the axle, owing to the forward position of the powerplant. Grilles slope at a decided angle and are Vee shaped. Windshields are also quite sloping, with gracefully rounded header panels. Inside the latter is provision for mounting the loud speaker for the radio set, when specified. This, of course, permits use of a smaller dash-mounted radio set, leaving more room for heaters, etc.

Hood louvres follow the same lines as in the Reo Royales. In four-door models both doors are hinged at the front. The rear-door pillar, it should be noted, curves back from the roof side rail to blend with the rear-panel line as viewed from the side of the car. Rear-quarter windows are fixed and extend back of the rear seat.

Headlamps are mounted from the radiator shell on streamlined brackets. Windshields are fixed in place. Front ventilating windows are of the sliding type, the windows sliding backward slightly when the crank is turned beyond the point where the window has been completely raised.

With the large rear compartment provided, no separate trunk models are available in the line.

New Weight Distribution Betters Riding Qualities of

1935 LINCOLN

EMPHASIS upon custom craftsmanship will mark the Lincoln program for the coming year. Of the 18 body types available, 12 are custom types created by Brunn, Judkins, LeBaron and Willoughby, and built in their workshops. Six standard body types are built in the Lincoln body shops.

All the new cars are powered by the improved V-12 engine of 150 hp. All body types are built on the 145-in. wheelbase chassis, with the exception of the more closely-coupled models, including the 5-passenger sedans, the five-and-two-passenger coupes, and the convertible types, which are on the 136-in. wheelbase chassis.

The new custom body types include: Brunn-Brougham, cabriolet (non-collapsible and semi-collapsible types) and convertible victoria.

Judkins—Two-window berline, three-window berline, and sedan-limousine.

LeBaron — Convertible sedan, convertible sedan - phaeton, convertible roadster, and two-passenger coupe.

Willoughby—Limousine and sport sedan.

The standard body types include a seven-passenger three-window sedan, five-passenger two-window sedan, and five-passenger coupe.

The new body lines were made possible by moving the engine forward, the primary object of which change was to improve the weight distribution.

The new front ensemble reveals a newly-designed radiator shell, a rust-proof grille of square honeycomb design, with a new radiator emblem secured directly to the grille, the radiator filler cap being now located beneath the hood top.

The engine hood extends almost to the windshield, providing an unbroken sweep from the radiator to the body

panels. The cowl ventilator is pointed to harmonize with the hoodline. There are new, larger, horizontal ventilating doors, outlined with chromium moldings, in the side hood panels. These, as well as the radiator shutters, are thermostatically controlled.

Fenders are more deeply crowned. Bumpers are of new single-bar type, with two vertical guards. Headlamps are smaller, with long tapering bodies. Two spare wheels mounted in front fender wells are standard equipment for all body types. Metal tire covers are finished with chrome bearing. Hub caps are of new design. Fenders, head lamps, wheels and tire covers are finished in the same color as the car body.

All but two of the body types have luggage compartments in the rear, access to which is through a wide door in the lower rear-quarter panel. The compartment is fitted with a "T" handle and lock, is lined with carpet, and automatically lighted when opened. Tool storage space is also provided. Additional luggage space is furnished by a folding trunk rack on the rear of all body types. The luggage compartment may be opened when the trunk is in place.

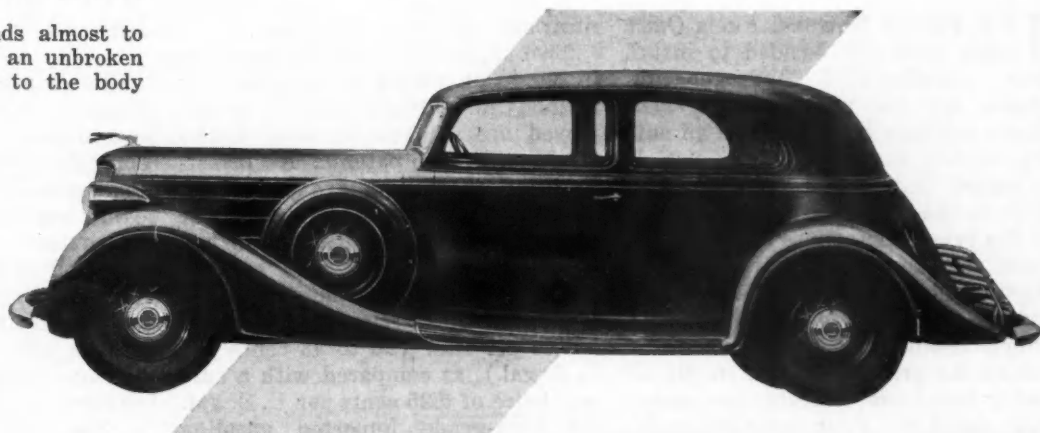
Upholstery is of pleated design. Colors harmonize with body colors. New garnish moldings are of walnut, with diamond-pattern inlay of curly maple. Safety glass is used in all windshields, doors and windows. The controlled

clear-vision ventilation system is continued. Front-door glasses slide back with an extra turn of the handle to form a ventilating slot. Rear-quarter-window glasses are hinged and may be swung outwardly for added ventilation.

Instruments are grouped in a cluster directly in front of the driver. A clock of new design is in the middle, and a glove compartment, with lock, at the right side of the instrument panel. There is also a large locked parcel compartment in the back of the front seat of five-passenger sedans. Provision is made for the installation of a radio set on the dash. Windshield control is of the one-hand type and located centrally on the top of the instrument panel. Sun visors are of an improved type, hinged in front.

In some types the doors are higher and wider. Each front seat is adjustable. Rear-seat cushions and backs are individually adjustable. Arm rests are provided on both front doors. Rear seats have arm rests and, in several cases, center folding arm rests. A recessed shelf back of the rear seat of closed models provides extra space for parcels. All body types have flap pockets on the rear doors.

A new degree of riding comfort is claimed to result from the new weight distribution in combination with a ride stabilizer, more flexible chassis springs, and relocation of passenger seats. Rear-seat passengers now ride farther



New V-12 150 horsepower Lincoln 5 Passenger Coupe for 1935

ahead in relation to the rear axle. More of the car weight is carried by the front axle.

The improved ride is enhanced by softer springs, larger tires of 7.50 x 17-in. section, and improved hydraulic double-acting shock absorbers. The latter have a neutral operating range within which they exert no modifying action on the springs. Gear shifting has been rendered easier by improvements in the gear-synchronizing mechanism. The effectiveness of the vacuum power brakes can be adjusted by

means of a convenient dash control.

The three-spoke steering wheel affords a more comfortable grip. Less pedal pressure is required to operate the clutch. Softer engagement is assured by new design features. The parking brake lever is located under the cowl, to allow more leg room in the driver's seat. More quiet operation of the transmission in both second and high speeds has been effected by alterations in design of the helical and spur gears. An additional support has been provided at the rear of the powerplant,

which now has a total of five points of support. The chassis generally is unchanged.

Operation of the V-12 engine has been improved by redesigning the camshaft, which now has larger cams. These are claimed to improve both the performance and smoothness of the engine. An enlarged exhaust system, including a larger muffler, dissipates exhaust heat more rapidly, further silences the exhaust, and contributes to engine efficiency. An engine oil filter of the cartridge type has been added.

New Hupp Six Puts Aerodynamic Styling in Lower Price Field

(Continued from page 29)

stock. Particular attention has been given to lightness consistent with high torsional strength. X-member front legs form box sections with the side rail and then sweep in at the front to become gusseting members for the front cross-member, located ahead of the front kick-up. Brackets for the front end of the rear springs are located immediately below the point where the rear X-legs join the side rails. The shock absorbers are mounted within the side rails, at both front and rear, the arm for the rear unit extending through the web.

A feature of the car which differentiates it from previous Hupp models is the adoption of Wagner-Lockheed hydraulic brakes. The brake pedal and lever and the clutch pedal are all mounted on the frame, so they will not participate in any movement of the

powerplant. Clutch operation is through two interconnected horizontal bell cranks, one at the clutch housing and the other one in a frame member at the pedal.

Other chassis units include a Warner Gear three-speed synchronized transmission, needle-bearing universals, and a spiral-bevel rear axle. Further engine details include a draft-cooled generator, a water pump integral with the fan but more compact than on the Series J, a Stromberg downdraft carburetor, Autolite electrical units, and a shield for the front end of the manifolds. Engine features include complete water-jacketing of the cylinder barrels, rifle drilled connecting rods, replaceable main and connecting-rod bearings, a high-compression head, and micromatic finish of cylinder bores.

Wheels are of pressed steel and 16

in. in diameter; they carry 6.00-in. tires. A cowl ventilator is provided on this model.

From an engineering standpoint the new car is particularly interesting because of its unusually low weight, considering the roominess of the body and the 118-in. wheelbase. This low weight has been achieved largely by a complete weight study of every part no matter how small, going into the new car. The low sedan weight of approximately 2950 lb. was achieved by saving ounces here and there, rather than by sacrifice of strength in vital parts. It is possible, of course, that the weight might have been brought down even lower if tooling costs had been permitted, but the result achieved would seem to amply justify the effort expended on this weight-reduction work on the Hupmobile 518.

Synthetic Gasoline Plants Being Erected in France

THE French National Fuels Office some time ago decided to install two experimental hydrogenating plants for the production of synthetic gasoline from coal. In an outline of the reasons for the plan it is stated that it is very disquieting that in the event of war or refusal of the present suppliers of petroleum fuels to continue deliveries, the Army might be cut off from its sources of motor fuel. All possible efforts should therefore be made to assure the production of a supply of motor fuel from domestic raw materials under the most favorable tech-

nical and economic conditions.

Two experimental plants are to be in operation within 15 months. The methods of hydrogenation to be employed are said to be based exclusively on French patents. An investment of 83 million francs (about \$5,500,000) is contemplated, of which 90 per cent will be furnished by the Government. The cost of production of the synthetic gasoline is tentatively estimated at 1.2-2 francs per liter (26 to 43 cents per U. S. gal.), as compared with a current price of 5.25 cents per U. S. gal. for high-grade imported gasoline

delivered in bulk at French ports.

* * *

Stainless steel grab handles will be fitted on the seats of thirty buses now in production by the Twin Coach Company of Kent, Ohio. These grab handles are ordinarily made of malleable iron and chromium plated, but it has been found that the plating wears off in the course of time, and the purchaser of these buses therefore specified stainless steel for the handles, which weigh one pound each and are made in the form of castings by the Pioneer Alloy Products Co., Cleveland, Ohio.

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Volume 72

Reg. U. S. Pat. Off

Number 2

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Automotive Industries

Cromodine

—the simplest

—the quickest

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METAL CONDITIONING PROCESS

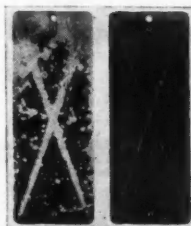


Cromodine, the newest of the metal conditioners, produces an excellent paint-to-steel bond . . . and materially improves the durability of finish coats of paint, lacquer, or enamel.

The process is . . . simple . . . foolproof . . . quick . . . and very inexpensive.

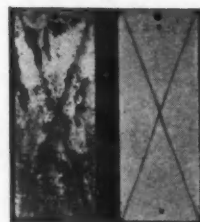
Anyone familiar with shop methods can operate the process . . . and keep it operating. And it will not slow-up production. Cromodizing requires only one minute.

Cromodizing is not expensive. A penny's worth of the chemical will condition about ten square feet of metal surface—a tenth of a cent per square foot.



HIGH BRAKE ENAMEL

The test panel on the left is cleaned steel coated with high brake enamel. The one on the right is Cromodized and coated with enamel. Both panels were placed in a salt spray together. The Cromodized panel was bent at a 90 degree angle and straightened.



SYNTHETIC ENAMEL

The test panel on the left is cleaned steel coated with Synthetic Enamel. The one on the right is Cromodized and coated with enamel. Both panels were subjected to a salt spray and a humidity cabinet. The Cromodized panel was bent at a 90 degree angle and straightened.

Ask for complete details on Cromodine . . . and a sample . . . if you wish to test this new process of metal conditioning.

AMERICAN CHEMICAL PAINT CO.

Ambler, Pa.

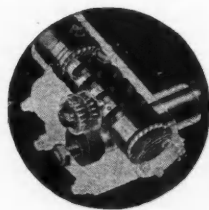
January 12, 1935

ROSS

C A M A N D L E V E R

STEERING

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